Local Complete Streets Design Guidelines

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1. REDEFINING CHARLOTTE'S STREETS

The Urban Street Design Guidelines described in this document present a comprehensive approach to designing new and modified streets within Charlotte's designated Sphere of Influence. The Guidelines will allow us to provide better streets throughout Charlotte – streets that reflect the best aspects of the streets built in the past, and that will provide more capacity and safe and comfortable travel for motorists, pedestrians, bicyclists, and transit riders.

Why Do We Need New Urban Street Design Guidelines?

Charlotte's tree-lined streets have long symbolized our City's beauty and quality of life. However, many streets have also come to symbolize the growing pains that can accompany growth and prosperity, with increased congestion in some portions of the City and streets that have become increasingly hostile to anyone but motorists. Therefore, these Urban Street Design Guidelines have been developed in response to two basic issues:

1) Charlotte needs to better plan for continued growth and development, and
2) Charlotteans want better streets.

1) <u>Growth and Its Consequences:</u> Charlotte grew very rapidly over the course of the last three or four decades. The City is expected to continue to grow rapidly, with an additional 350,000 people projected to be living here over the next 25 years, along with 360,000 additional employees working here, many of whom will be commuters from other towns and counties. Our ability to accommodate this growth using the same development and transportation approaches as were used during previous decades is questionable at best. Our ability to do so *while also maintaining our high quality of life* is even less likely. Quality of life is one key to Charlotte's continued economic development.

The Urban Street Design Guidelines are intended to help the City accommodate growth in several ways. They support a variety of City policies, including the Centers, Corridors and Wedges growth framework and the recently adopted Transportation Action Plan, which describes the transportation-related policies and programs needed to help Charlotte maintain its many advantages as it continues to grow.

The Guidelines will help achieve the emerging vision for Charlotte (summarized in the box on the right) by supporting the goal of more compact and focused growth, and by offering more transportation choices. These are complementary intentions because compact development makes providing transportation choices easier and providing transportation choices makes compact development more liveable and viable.

Vision for Charlotte

"To be an urban community of choice for living, working and leisure"

- More compact and focused growth
- Protection of environmentally sensitive areas
- Expanded travel choices
- Mix of uses/integration of live, work, shop and play
- Viable and healthy economy
- Maintenance of quality, livable neighborhoods
- Revitalization and infill in older areas
- Variety of housing choices and costs
- High quality urban design
- Infrastructure needed to support development
- Empowered, informed and engaged citizenry

"Transportation choices" are created both by providing more connections - more route choices for all travelers - and by building streets that are easier to use by more types of travelers – by people who want to walk, ride transit, or ride bicycles. Generally, more connections and better provision for all modes will help increase our transportation system's capacity, further sustaining growth. Providing transportation choices also helps address an important environmental consequence of growth – poor air quality. In Charlotte, like many cities, our major air pollution problem is ozone, which is created when nitrogen oxides and volatile organic compounds combine in sunlight and stagnant air. In Mecklenburg County, nitrogen oxides are emitted mostly by motor vehicles. Therefore, the sheer number of cars and the miles they travel have a great impact on our air quality. In addition to the health effects of poor air quality, this also rep-

resents a significant potential cost, since our region must remain in compliance with federal standards on certain pollutants, including ozone. Failure to comply can result in withholding of federal funding for transportation projects, which can further impact our city's ability to sustain development. Air quality, therefore, is an important component of both quality of life and continued economic development.

One way to affect air quality is by reducing three aspects of motor vehicle use - the vehicle miles traveled (VMT) and the number and duration of engine starts. VMT refers to the total number of daily miles traveled by motor vehicles within or through a geographic area. It is virtually impossible to reduce total VMT in a growing city, but it is possible to reduce *VMT per capita*, so that each additional person doesn't increase VMT by the same amount as each person does today. We can help do this by offering viable transportation choices for people as they travel between land uses, an important goal of these Urban Street Design Guidelines.

The Urban Street Design Guidelines will also help Charlotte plan for growth by better matching the transportation network to the land uses that lie along that network. Better integration of land uses and transportation, through context-based design, will ensure that mutually reinforcing decisions are made and that peoples' ability to take advantage of more transportation choices is enhanced.

The disconnected, cul-de-sac development style shown above reduces the street network's ability to handle traffic, because it forces all traffic onto a few streets. It also makes it more difficult for people to walk or bicycle between land uses, because of the lack of direct (shorter) routes.

2) <u>Better Streets:</u> Building streets to provide more choices will help Charlotte meet the challenges of growth, but it also means that we will be building better streets overall – the types of streets that Charlotteans have said they want. Stakeholder interviews held early in the development of the Guidelines resulted in a list of "most favorite" and "least favorite" Charlotte streets. The "most favorite" streets are typically located in the older, central neighborhoods of Charlotte. These streets include an abundant tree canopy and pedestrian amenities and were built before the dominance of the automobile.

Queens Road West

Colony Road

Tryon Street, Uptown

East Boulevard

The Plaza

Among the "least favorite" streets are those that reflect the prevailing approach to street design since WWII – the approach used throughout the outlying areas beyond Route 4. This approach is intended to move cars safely and swiftly through the City by adding lanes and otherwise increasing capacity…with little regard for the less positive impacts on others using the streets. These "least favorite streets" typically lack pedestrian amenities. Driveways, parking lots, and utility poles are more abundant than trees. They often consist of wide expanses of pavement for moving traffic. Even accounting for the different design and orientation of the land uses along the streets, motorists are clearly the dominant "users" of the least favorite streets.

Independence Boulevard

Harris Boulevard

Highway 51

Sharon & Fairview Roads

South Boulevard

The stakeholder interviews revealed that, across a broad spectrum of stakeholder groups, Charlotteans want streets that are:

- aesthetically pleasing (including street trees), and
- comfortable and safe for pedesrians and cyclists (specific design treatments and speed reduction were mentioned by several groups).

A follow-up internet-based survey of almost 1,000 people substantiated that the streets people most "prefer" do not look or function like many of the streets that we have been building in recent years. Some progress has been made - our ordinances and standards for local streets have been updated to provide better streets (to build sidewalks on both sides of the street and to reduce the use of culs-de-sac, e.g.). However, those standards still are not creating the quality of streets that people have said they prefer or that were built in previous eras – walkable, well-connected streets with street tree canopies. Further, our current street designs make retrofitting many of the streets built over the last 50 years (to include street trees, wider sidewalks, or more connections, e.g.) very difficult.

Since streets provide the framework for both current and future development, their long-term usefulness for all modes must be enhanced.

What Are the Guidelines Trying to Achieve?

Providing the best possible streets to accommodate growth, provide transportation choices, and help keep Charlotte liveable requires a different approach to and philosophy of planning and designing streets. Cities across the country are seeing the need to plan for and design "complete" streets – streets that better serve all users, rather than focusing only on one set of users. The Urban Street Design Guidelines are essentially Charlotte's complete street guidelines.

Through the years, we have become very good at designing auto-oriented streets, which has had unintended consequences. We are now getting better at providing design elements such as sidewalks, planting strips, and bike lanes on thoroughfares, but we do not have a consistent, clear method to decide which types of streets to build where. The Urban Street Design Guidelines will help us to get better at designing complete streets for all users. To accomplish this, City staff developed these Guidelines based on the following principles:

- Streets are a critical component of public space.
- Streets play a major role in establishing the image of a community. Therefore, they affect the health, vitality, quality of life, and economic welfare of a city.
- Streets provide the critical framework for current and future development. The locations and types of streets will affect the land development pattern, as well as how much development can be supported by the street network.
- The design of a street is only one aspect of its effectiveness. How the street fits within the surrounding transportation network and supports adjacent land uses will also be important to its effectiveness.
- Charlotte's streets will be designed to provide mobility and support livability and economic development goals.
- The safety, convenience, and comfort of motorists, cyclists,

pedestrians, transit users, and members of the surrounding community will be considered when planning and designing Charlotte's streets.

- Streets should be designed to encourage Charlotteans to make trips by means other than cars, thereby positively impacting congestion, air quality, and the health of our citizens.

- Planning and designing streets must be a collaborative process, because it is necessary that decisions about the street be made with a variety of interests and perspectives represented.

Based on these principles, the recommendations contained within these Urban Street Design Guidelines reflect the following basic goals:

1) ***Support economic development and quality of life*** *– by providing more transportation capacity, while creating more user-friendly streets overall.*

2) ***Provide more and safer transportation choices*** *– by creating a better-connected network (route choices) and building streets for a variety of users (mode choices).*

3) ***Better integrate land use and transportation*** *– by avoiding "mismatches" between land uses and streets and by creating the right combination of land uses and streets to facilitate planned growth.*

Figure 1.1

The New Street Types: Creating an Urban Street Network

To meet the goals described above, Charlotte's streets will be classified according to the following five street types:

- Main Streets
- Avenues
- Boulevards
- Parkways
- Local Streets

These street types fall along a continuum (Figure 1.1), with the Main Street being the most pedestrian-oriented street type and the Parkway being the most auto-oriented street type. "Pedestrian- and auto-oriented" refer both to the design of the street itself and to the characteristics of the land uses located along the street.

Even though each street type emphasizes different mixes of modes, all of these streets will be designed with all potential travelers and stakeholders in mind. By creating a variety of street types, the street network can better provide appropriate choices for those travelers and stakeholders, including Charlotte's current and future residents, commuters and visitors. Once a street (or portion of a street) is classified as a certain street type, the street design should reflect that classification and future land use decisions

along the street should also reflect that classification. Street design decisions and land use decisions should be mutually reinforcing, to create effective synergy between streets and land uses.

While a complete description of these street types and land use characteristics is provided in Chapter 4, the following are brief descriptions of each street type:

- ***Main Streets*** are "destination streets". They provide access to and function as centers of civic, social, and commercial activity. Main Streets are designed to provide the highest level of comfort, security and access for pedestrians. Development along Main Streets is dense and focused toward the pedestrian realm.

Land uses on Main Streets are typically mixed and are generators and attractors of pedestrian activity. Because of their specialized function and context, Main Streets will represent a relatively small portion of Charlotte's overall street network.

- ***Avenues*** can serve a diverse set of functions in a wide variety of land use contexts. Therefore, they are the most common (non-local) street type in our city. They provide access from neighborhoods to commercial areas, between major intercity destinations and, in some cases, through neighborhoods. Avenues serve an important function in providing transportation choices, because they are designed to provide a balance of service for all modes of transport. They provide for high quality pedestrian access, high levels of transit accessibility, bicycle accommodations such as bike lanes, yet they may also carry significant automobile traffic. Most *thoroughfares* in our street network would be classified as Avenues. The *collector/connector* function can also be served by some Avenue cross-sections.

- ***Boulevards*** are designed to move larger numbers of vehicles (as through traffic) from one part of the city to another and to other lower level streets in the network.

Therefore, maintaining vehicular movement is a higher priority than with an Avenue, but pedestrians and cyclists are still provided for in the design. In fact, the higher speeds and traffic volumes increase the need for safe pedestrian and bicycle treatments, such as providing adequate buffers from the traffic. Land uses along Boulevards can vary, but development will usually be set back further from the street than on Avenues.

- ***Parkways*** are the most auto-oriented of the street types. A Parkway's primary function is to move motor vehicle traffic efficiently from one part of the metropolitan area to another and to provide access to major destinations. Therefore, design decisions will typically favor the automobile mode over other modes. As with the Main Street, relatively few streets in Charlotte will be classified as Parkways.

- ***Local Streets*** provide access to residential, industrial, or commercial districts, as well as to mixed-use areas. They represent the majority of the lane miles of Charlotte's street network. Speeds and motor vehicle traffic volumes are low, providing a safe and comfortable environment for pedestrians and bicyclists. Since Local Streets are built through the land development process, specific cross-sections for a variety of different Local Street types are available. For residential streets, three alternative cross-sections are defined (narrow, medium, and wide), based on the expected need for on-street parking. For office/commercial Local Streets, two alternative cross-sections are provided (narrow and wide), based on the

expected need for on-street parking. The general intent is to keep the pavement on these streets as narrow as possible.

How Do these Guidelines Relate to Other Transportation Planning Activities?

With the 2006 adoption of the Transportation Action Plan (TAP), the City of Charlotte established a comprehensive plan for providing the necessary transportation elements to sustain Charlotte's growth and quality of life. The TAP describes the policies, programs, and projects that will be implemented over the next twenty-five years to ensure that Charlotteans have the most travel choices available to them as the City grows. The Urban Street Design Guidelines, by describing how Charlotte's streets should be designed, is a fundamental component for implementing the TAP and providing the necessary street network for decades to come.

In addition to the TAP, the Urban Street Design Guidelines will relate to other planning processes, including the existing State-required Thoroughfare Plan and emerging Comprehensive Transportation Plan. Both of these planning approaches are based on the functional classification of streets. The new street types described in the Guidelines are intended to work as "overlays" to existing street classifications. This means that, while a street might be identified, for example, as a major thoroughfare from a functional standpoint, it might be labeled an Avenue from the Urban Street Design standpoint. The Urban Street Design Guidelines classification will then affect the planning and ultimate design of the street. An important point is that a given street may be classified differently on different segments, for example, as an Avenue for one portion of its length and as a Boulevard for another. Since most thoroughfares traverse more than one land use context, the Urban Street Design classifications will allow the ultimate design of the street to reflect those various contexts.

The use of this "overlay" approach will likely need to be refined somewhat, as NCDOT moves away from its traditional thoroughfare planning process. Recent attempts to make state road planning better reflect multi-modal and context-based design have resulted in a new type of plan to replace the Thoroughfare Plan – the Comprehensive Transportation Plan (CTP). The CTP will use some different classification schemes than the Thoroughfare Plan. The Urban Street Design Guidelines classification system should work in tandem with the CTP, with the major difference being the street function anticipated by NCDOT or the city.

By having a set of street types that better reflect and complement a variety of land use contexts, Charlotteans and visitors can expect to find viable transportation choices as they travel through the City, something that has become increasingly difficult in recent decades. Further, by defining and implementing street designs to meet the intent of the different street types, we have the best chance of meeting

the multiple and sometimes conflicting objectives of the different users of our streets. ***Charlotte's Urban Street Design Guidelines will, over time, result in a well-connected network of "complete" streets that function well for all users and that complement and preserve the communities and neighborhoods they connect.***

Content of the Guidelines

The following chapters are intended to provide a comprehensive treatment of Charlotte's approach to street design. Each chapter provides a separate, stand-alone piece of information pertaining to street design, but each chapter also relates to the others. In this fashion, the Guidelines provide both the "big picture" of developing Charlotte's desired street network *and* the detailed guidelines necessary to design individual street segments and intersections. The remaining chapters include:

- **Chapter 2: Designing Streets for Multiple Users.** This chapter presents a thorough treatment of the need for and approaches to evaluating the tradeoffs among competing users and uses of the street right-of-way.

- **Chapter 3: Applying the Guidelines.** This chapter defines a recommended approach to applying the Guidelines, particularly in the case of non-local streets.

- **Chapter 4: Segments.** This chapter contains detailed information (text and diagrams) describing how to design the portions of the streets between the intersections.

- **Chapter 5: Intersections.** This chapter contains detailed information (text and diagrams) describing how to design various types of intersections.

- **Chapter 6: Glossary.** This chapter includes definitions or descriptions of different design elements, their intended purposes, and how they are best applied.

- **Appendices.** Appendices A-C provide additional details about the application of the new approaches outlined in the Guidelines.

Related Content Items to be Developed

Although the current document includes comprehensive coverage of planning and designing Charlotte's street network, there are some additional, related items that will be developed over the coming months and treated as supplements to the Urban Street Design Guidelines. Some of these are items that will require additional stakeholder comment or will be treated as part of the implementation of the Transportation Action Plan or the adopted Urban Street Design Guidelines. These additional items include:

- a section on designing "special" street types, such as green streets, alleys, culs-de-sac, one-way streets and private streets;

- more details on "connector" streets, including development of a connector map;
- a section describing access control, including driveway designs;
- updates to the City's Sight Distance Policy and pavement standards; and
- an appendix describing horizontal and vertical curvature allowances on Local Streets.

2. DESIGNING STREETS FOR MULTIPLE USERS

These Urban Street Design Guidelines are intended to ensure that the best aspects of Charlotte's transportation network are re-created as the City and its street network continue to evolve. This means that the various street design elements (described in Chapters 4 and 5) must be applied in the right mixes and in the right places. The process for planning and designing streets must also be sensitive to both the land use context and to the needs of the various users of a street. This chapter provides information about how different travelers may expect different things from a street. Equally important, the following chapter (Chapter 3) describes a method for applying the Guidelines so that any tradeoffs are evaluated fairly for all stakeholders.

Assessing Tradeoffs: Who is Using the Street?

The first step towards designing streets that provide viable transportation options is to understand that different users of the street will likely have different expectations of what makes a "good" street. A street design solution that works well for a motorist, for example, may or may not work well for a pedestrian or a bicyclist. This is one reason many American cities are becoming more concerned about providing "complete streets." Further, even if every "ideal" design element for all of the *travelers* on a street were provided, then the resulting street might not satisfy the expectations of the people who live or work along it. These different stakeholders and their expectations for a street can complicate the design process, which is one reason Charlotte has developed these Guidelines.

Prior to the 1990s, street design was treated as a relatively straightforward task, with a pre-set menu of (often auto-oriented) cross-sections for streets with pre-defined functional classifications. That approach is changing in many cities, for a variety of reasons. One reason is that right-of-way becomes constrained as cities develop, and "standard" cross-sections are less likely to fit within the available right-of-way, particularly for retrofit projects. Another reason is that there is increasing concern about providing facilities that can be used by people other than motorists. In these cases, designing the street has had to become a more analytic process - one that considers the various user perspectives and the surrounding land use context, *in addition to* the street function.

These Guidelines are intended to ensure a process that clearly, consistently, and comprehensively considers the needs of motorists, pedestrians, and bicyclists when planning and designing streets. All streets should be evaluated in terms of how they affect many different groups, including:

- motorists,
- pedestrians (including transit riders),
- transit operators,
- bicyclists, and
- people living, working, or otherwise using the adjacent land uses.

Each of these groups has expectations about how a given street should function and, therefore, how it should be designed. The following examples describe various street users' perspectives and how they might be addressed in the design process.

What Do Motorists Want From Streets?

When a motorist expresses a concern or makes a request related to streets, it often stems from congestion or safety concerns. Motorists might expect streets to be widened and signalized intersections to be timed to enhance their own travel times, for example. They may also ask that the number of stop-controlled intersections on local streets be reduced, so that they can maintain free flow through neighborhoods. This interest in design features that motorists feel provide them "safe and efficient" travel has also long been the primary concern of highway designers.

To meet motorists' expectations for safe and efficient travel, perfect conditions over the street network would include:

- minimal travel delays,
- minimal conflicts (affecting both delay and safety), and
- consistently designed facilities.

For the most part, though, urban streets cannot provide this combination of conditions except perhaps on freeways or other access-controlled roadways. Even then, travel delay and potential for conflicts with other vehicles will vary by time of day. Furthermore, consistent design is not only difficult to provide on urban streets, but probably not even desirable for other reasons (it is at odds with the concept of context-sensitive design).

Although providing all of the favorable conditions for motorists described above is difficult, there are ways to achieve some of the motorists' preferences, either through construction or operational changes. These approaches include:

- adding through or turn lanes to increase capacity, which can help reduce delay, at least temporarily;
- making operational changes, such as providing more green-signal time to the street with the higher traffic volumes, which can reduce the wait time at signalized intersections *for those motorists on the higher volume street* while increasing the wait time for motorists entering from the lower volume side street;
- constructing grade-separated intersections and roundabouts, rather than signal or stop controlled intersections, which can also limit delay and increase capacity; and
- using bus pullouts to separate stopping transit vehicles from the travel lane and, therefore, to help reduce delay.

A roundabout can slow traffic without making the motorist actually stop.

Motorists not only want to travel quickly, but they also want to arrive safely. A variety of design features have been used through the years to enhance motorists' safety. For example:

- wide travel lanes are generally considered more forgiving to the motorist than are narrow travel lanes;
- turn lanes separate turning vehicles from the through traffic, potentially reducing rear-end collisions;
- medians separate opposing traffic streams;
- greater sight distances generally improve a motorist's ability to "see and be seen", thereby providing greater opportunity to avoid collisions;
- street lighting improves overall visibility; and
- a clear zone adjacent to the outside travel lane provides an extra measure of "forgiveness", should a vehicle actually leave the travel lanes.

In addition to these traditional, auto-oriented engineering designs, there are also design features that are desirable for other travelers, but which also have safety benefits for motorists. For example, bike lanes and planting strips, which buffer

A median can increase motorist safety and provide a refuge for pedestrians. However, it might also encourage higher speeds than desired.

pedestrians from traffic, also improve motorists' safety by increasing sight distance and by reducing the potential for conflicts between autos, bicycles, and pedestrians. Minimizing conflicts provides the motorist potential travel time savings and increased safety. Many of the "safety features" described on the previous page are, in fact, ways to minimize conflicts for the motorist.

As described, there are many ways to meet motorists' expectations for safe and efficient travel. However, doing so can have unintended and paradoxical results - many of the design elements listed above also tend to encourage higher speeds, thereby potentially *reducing the safety of not only motorists, but also bicyclists and pedestrians.* Design features that can encourage higher speeds include:

- wide travel lanes (particularly if the overall street cross-section is wide),
- a large clear zone (including a lack of street trees),
- medians,
- large (wide) curb radii at intersections and driveways, and
- straight, flat sections of streets with long blocks and widely spaced intersections.

Some drivers drive fast to reduce their travel times. Some drivers simply like to drive fast. Besides the safety paradox just described, this "need for speed" usually translates into rapid acceleration and deceleration between intersections, often with minimal impact on a driver's total travel time, but with significant impacts on pedestrians, bicyclists, and others using the street. These types of interrelationships and tradeoffs need to be considered when attempting to address motorists' expectations, particularly if that involves physical changes to streets and intersections.

What Do Pedestrians Want From Streets?

A traditional approach to street design might define pedestrian needs as simply 1) a sidewalk and 2) the ability to safely cross the street. These are, indeed, crucial to creating a safe walking environment. However, pedestrians expect and need more than just "walking space" to feel safe and comfortable, and these Guidelines consider many factors as important to pedestrians. If we are to support and encourage walking as an attractive and viable travel mode, our street designs should reflect that pedestrians also value features that:

- help shorten walking distances,
- separate (or buffer) pedestrians from moving traffic,
- create aesthetically pleasing surroundings and amenities,
- protect pedestrians from the elements, and
- let them walk as safely as possible.

In addition, some special pedestrian populations may have other, specific concerns and their needs must also be considered. For example, safe crossings for blind pedestrians may require a different set of design features than those for pedestrians in general.

Many individual design elements can provide for any one of the general

categories of pedestrian expectations described above. However, effectively encouraging more pedestrian travel typically requires a combination of several design elements, since the pedestrian is reacting to the overall walking environment. For example, the combination of

Many design elements combine to make this a functional pedestrian environment.

safe crossings, security lighting, and wide sidewalks may not encourage walking if people feel *they have nowhere to walk to.* For walking trips other than for pure recreation, this means that a walkable environment includes a mix of land uses in close enough proximity to walk comfortably between them.

People are much more likely to walk to a given destination if walking distance is minimized or if they perceive that the distances are not too long. In business districts, for example, typical acceptable walking distances may be longer than in an office park, since people are more likely to have stores, windows, and ground floor features to look at while they're walking in the business district. Conversely, walking in an office park often means traversing large parking lots with little visual stimulation, all of which makes the walk seem longer. Perceived distance, therefore, can be influenced by providing the right types of land uses and design characteristics. Distance can also be minimized by creating direct connections between land uses. Design elements that create better connections include:

- short blocks with marked intersections,
- safe mid-block crossings on longer blocks, and
- continuous walkway systems that connect door fronts with transit stops or other destinations.

Buffering pedestrians from passing cars also increases their comfort, even if they already have their own "walking space". Pedestrians generally find sidewalks with some sort of buffer more attractive than sidewalks built right next to moving traf-

fic. Several design elements can help to create suitable buffers between pedestrians and traffic, including:

- planting strips,
- bicycle lanes,
- landscaping, and
- on-street parking.

These elements may be used alone or in combination. The dimensions of any one of these elements might vary, depending on how and whether it is combined with others. For example, an 8' planting strip will allow large maturing trees, which creates two types of buffer. That type of additional buffering is particularly important on a high-speed, high-volume street. By the same token, a 4' planting strip will still allow landscaping, but might require some additional form of buffering to increase the comfort level, even for those traveling on a lower-volume street. In that case, a bike lane or designated on-street parking could provide the extra buffer. The "correct" combination of these elements will depend on the space available, the various stakeholders' expectations, the land use context, and the objectives for the street.

The planting strip and trees combine for both vertical and horizontal buffering between pedestrians and motor vehicles.

Security is also an important consideration, since pedestrians will feel more vulnerable than motorists in many circumstances. A pedestrian's sense of security is improved by:

- providing street lighting and pedestrian scale lighting, and

This "back-of-curb" sidewalk provides no buffer between pedestrians and vehicles.

- increasing pedestrian visibility from adjacent land uses (by placing windows/doors/"eyes on the street").

Urban design can go a long way toward enhancing or hurting a pedestrian's sense of security - blank walls and facades, lack of windows and doors facing onto the street, and very large setbacks, for example, will isolate pedestrians from other activities and people.

Personal safety is also affected by the numbers and types of traffic conflicts to which pedestrians are exposed. The number of conflicts faced by a pedestrian can be reduced by:

- managing driveway access to minimize and control the locations of turning cars, and
- providing median or corner pedestrian refuge islands, which help to break up a crossing into more easily manageable parts.

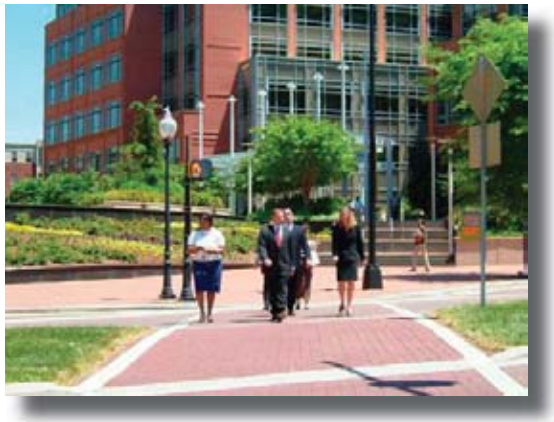
This route would not seem secure to most pedestrians.

These design elements basically allow a pedestrian to only have to consider the various traffic movements one at a time. The overall distance (or time) over which the pedestrian must deal with potential conflicts can also be minimized by:

- reducing the number of travel lanes,
- providing curb extensions,
- designing smaller curb radii, and
- providing sufficient signal timing so that pedestrians do not feel "trapped" in an intersection.

In a less obvious fashion, a robust street network, with many connections, can make it easier to provide the pedestrian-friendly design treatments just described. **For a thorough discussion of how various intersection design elements, in combination, affect pedestrians at signalized intersections, see Appendix B.**

Conflicts between pedestrians and vehicles are not limited to motor vehicles,



The design elements on this route enhance the perception of personal safety and security.

but also occur with bicycles. Cyclists traveling the wrong way in mixed traffic or on the sidewalk are particularly dangerous, because they are traveling faster than pedestrians, but they are less visible and make less noise than motor vehicles. That is why bike lanes serve an important function for pedestrians that goes above and beyond the extra buffering described earlier.

A daunting intersection, from a pedestrian's perspective.

Aesthetics can also have a major impact on enhancing pedestrian comfort. Streetscape elements that impact aesthetics include:

- pedestrian scale lighting,
- benches,
- trash receptacles,
- landscaping,
- urban design treatments for adjacent development, and
- walking surface texture.

These design treatments can enhance aesthetics, but are also important functional elements. For example, trees and other forms of landscaping are not just "pretty" to look at, but also provide shade and buffering. Likewise, awnings along major pedestrian routes provide shade and shelter to make the walking environment more comfortable.

What Does Transit Want From Streets?

The "transit perspective" really needs to be discussed in terms of two different types of perspectives – that of the transit driver and that of the transit rider. Transit drivers are generally interested in and prefer the same street design elements as those who drive other large vehicles. Transit riders are essentially pedestrians, but pedestrians who are also interested in the placement and/or design features of bus stops and shelters. The street design team should consider both to help ensure transit's viability as an attractive mode of transportation.

Transit drivers have expectations specific to their need to operate very large vehicles along sometimes very busy streets. Transit drivers basically want:

- enough space to operate and maneuver their vehicles,
- minimal conflicts with other

travelers and with features along the sides of the street, and
- minimal delays, to help keep their route operating on time.

Design elements that help provide the space for buses to operate include:

- wide travel lanes,
- wide corner turning radii,
- street signs, utility poles, and on-street parking located to maximize clearance for side mirrors, and
- adequate merging distances.

Transit drivers also want to reduce the potential for conflict between transit vehicles and other travelers. In addition to minimizing driver fatigue, reducing such conflicts can also help minimize schedule delays, which harm transit operations and performance. Conflicts can be minimized by:

- selecting safe locations for bus stops, and
- providing signal priority for transit vehicles.

Just as delay will affect transit operations, so can the ability to provide more route coverage and travel efficiency. Coverage and efficiency are impacted by the extent of the street network. Short blocks providing multiple route options can increase pedestrians' access to transit as well as transit's access to more land uses (and potential riders).

Transit riders have the same types of interests as do other pedestrians, with some additional, specific expectations. Transit riders also want:

- accessible bus stops,
- easy connections, and
- personal comfort and security while waiting for the bus.

Generally speaking, accessibility comes from having well-located transit stops on a well-connected network. The spacing

of bus stops and their locations relative to pedestrian-oriented or clustered land uses will affect peoples' ability or willingness to use transit. Transit stops should be located so that walk distances are not excessive. In addition, those land uses located near transit stops should be designed with entrances and sidewalks connecting buildings directly to the stop or to the nearest public sidewalk.

Accessibility is further improved by having a dense, well-connected network for pedestrians. Such a network can be achieved by including short blocks on the street network or bike-pedestrian

A pedestrian connection between a neighborhood street and a thoroughfare enhances pedestrians' route options.

pathways. Either way, the connections should include paved surfaces. The unpaved pedestrian path that might be adequate for joggers will be inadequate for commuters using transit, for example.

Closely related to their need for accessibility, transit riders also want to be able to change modes as easily as possible. Intermodal accessibility is provided through an extensive pedestrian sidewalk network with easy street crossings (defined earlier for all pedestrians), direct vehicle connections to park and ride facilities, and bike racks at stations and bus stops.

Unlike most other pedestrians, transit riders must occasionally be stationary. At transit stops, transit riders will be concerned about their own comfort and personal security. Riders' security concerns may be more pronounced than those of other pedestrians, because transit riders may perceive that they are more vulnerable once they stop walking and start waiting. Perceived or actual security can be enhanced by a variety of design features, including:

- street and pedestrian-scale lighting.
- transit stop locations that are not isolated from land uses and other people, and
- increased visibility through urban design (windows and doorways that face onto the street, for example).

Basic comfort for waiting riders can be achieved by buffering them from through traffic lanes (see "pedestrian needs" for a list of elements that achieve this), and by transit shelters, bus pads, benches, trashcans, and other amenities.

Here, amenities from a bygone era have been updated.

Finally, some design elements have positive impacts on both the transit driver and the rider, while others can have unintended negative consequences for one or the other of these two groups. For example, the quality of the vehicle ride

A transit shelter located on Randolph Road.

affects both drivers and riders. The ride quality can be improved by minimizing vertical grade variations along curb lanes at cross-streets and drainage grate areas, and by providing smooth, well-maintained street surfaces. Conversely, the wider lanes and curb radii that provide more maneuvering space for the transit vehicles can create less comfortable streets for transit riders. Bus pullouts may *reduce* delays to motorists who would otherwise have to wait behind the stopped bus, but may *cause* delays for transit riders when the driver has to wait for a gap in traffic to merge back into the travel lane. The point is that there are tradeoffs inherent in many of the decisions that must be made as part of the street design process – and what works well for one type of traveler may or may not work well for another type of traveler.

What Do Bicyclists Want From Streets?

Different types of bicyclists have different perspectives or expectations related to their trips. Those expectations will vary according to the type of cyclist and the type of trip - experienced vs. casual cyclists and transportation vs. recreational trips. Experienced cyclists typically feel more comfortable traveling in the traffic lanes than do casual cyclists. Casual cyclists will often avoid mixing with traffic and will feel more secure riding in separate, dedicated bike lanes. Experienced cyclists who are commuting to work will typically take the shortest, most direct route, while recreational cyclists and/or less experienced cyclists may seek out indirect routes, either to enhance their recreational experience or because they are avoiding higher-volume, higher-speed streets.

Either way, bicyclists of all kinds generally want:

- a well-connected network of bicycling facilities,
- safe travel routes, and
- direct travel routes, particularly when bicycling for purposes other than strictly exercise or recreation.

A dedicated bicycle network that connects neighborhoods, schools, parks, and other activity centers must be developed for bicycling to become a viable travel mode in Charlotte. That bicycle network should include direct routes, multiple

Dedicated space for bicyclists is one way to create a good bicycle network on higher speed, high volume streets.

route options, and dedicated cycling space. Direct routes can be provided through both a continuous network of local streets and through bike lanes on higher-volume streets. Short blocks help to create the dense network necessary for direct routes and lower-volume route options. Signed bike routes and other wayfinding treatments can make it easier for casual cyclists to travel on the local street network for short trips that might otherwise be made by car.

On higher-volume, higher-speed streets, a bike lane is necessary for cyclists' safety and comfort. The width of the bike lane is very important:

- the minimum width for a designated bike lane is 4' of usable asphalt surface, with 5' preferred;
- where the bike lane is next to parked cars or on steep, uphill grades, 6' may be necessary, since the cyclist may need room to avoid opening car doors or to pedal uphill (which can cause "wobbling").

In cases where space is insufficient for an official bike lane, edge striping should be used to keep motor vehicles within 10' of the center line or next travel lane.

Cyclists also need to be visible to motorized traffic. There are a variety of design elements that help improve bicyclists' visibility, including:

Signed bike routes on the local street network also contribute to a good bicycle network.

- designated bike lanes,
- pavement markings,
- street lighting,
- bike boxes and bike signals at intersections, and
- buffers from travel lanes and parked cars.

Conflicts with cars, buses, and pedestrians can also be minimized through reducing driveway frequency in commercial areas and providing bike lanes.

For bicyclists to operate their vehicles safely, they also need smooth, continuous surfaces. These surfaces are affected both by paving and by drainage grate design and/or maintenance. Grates should never run parallel to the direction of travel and pavement markings should be carefully assessed for potential slickness.

These images show the importance of well-designed drainage grates.

Bicyclists have special types of problems traveling through intersections, since they must operate their bikes as vehicles, but they are smaller and more vulnerable than the other vehicles. At intersections, it is particularly important that bicyclists be visible to both motorists and pedestrians. Design elements that improve cyclists' visibility at intersections include:

- bike lanes that are located appropriately in relation to the vehicle turn lanes,
- lead signal indicators (which provide a headstart and allow bicycles to clear the intersection ahead of motor vehicle traffic),
- bicycle stop bars (which provide similar advantages as the lead signal indicators), and
- bike boxes, which require a bike lane leading to the intersection (see photo).

A bike box at an intersection.

Roundabouts allow vehicles, including bicycles, to continue moving, although at reduced speeds.

Bicyclists also benefit from any design element that allows them to avoid stopping or that reduces their delay once they do stop. Cyclists generally want to avoid stopping, since starting back up is not easy, particularly if it must be done quickly and in mixed traffic. Reducing delay can be achieved by the use of roundabouts, lead signal indicators, and bike sensitive signal detectors. **For a thorough discussion of signalized intersection features and their effects on cyclists, see Appendix B.**

What Do the Adjacent Land Uses Want From Streets?

Thus far, the discussion has focused on those who travel along streets, but these are not the only stakeholders who have an interest in streets. Other people who have an interest in how streets are designed include residents, business owners, property managers, employees,

and other occupants of buildings along a street or in adjacent neighborhoods. These types of stakeholders often consider themselves most impacted by designs or design changes intended to meet the needs of other stakeholders, particularly those of motorists. These "stationary" stakeholders' perspectives are an important consideration when deciding which street design elements should be included.

People who occupy neighboring land uses may have different perspectives on street design, depending on whether these are residential or commercial land uses. Either way, these stakeholders will all want to feel safe and secure, to have access to their property, and to enjoy an aesthetically pleasing environment. Therefore, they will likely see the following design elements as beneficial:

- lighting,
- safe and contained travelways,
- driveways (for access to their properties), and
- trees and landscaping.

These stakeholders will typically not want to lose portions of their property, so minimizing the overall right-of-way width may be seen as beneficial to most of these stakeholders, as well.

Owners, inhabitants, or managers of residential, institutional, commercial or any pedestrian-oriented properties typically are very concerned about safety. These stakeholders want slower traffic speeds and, in some cases, lower traffic volumes. The types of street design elements that can help achieve this include:

- traffic calming devices,
- low design speeds,
- safe and convenient pedestrian crossings, and
- reduced street widths.

A "choker" on a local street.

Speed tables or "humps" are widely used for traffic calming.

In residential and institutional zones, reducing the noise from motor vehicles may also be important. Some forms of traffic calming can help achieve some level of noise reduction, but for major thoroughfares, the best way to achieve this may be to provide more separation between apartments or condominiums and the travel lanes. People who live or work in residential or institutional zones may also express concern about pedestrian and/or bicycle pathways located "too close" to their properties, due to (typically unsubstantiated) security concerns.

Owners or operators of commercial uses, particularly lower-density, less pedestrian-oriented commercial uses, will want automobile access and visibility. Therefore, these stakeholders might:

- oppose access controls (limiting-driveways), and
- oppose medians, but
- want turn lanes, and
- want median breaks allowing access to their commercial properties.

In addition to automobile access, owners or operators of higher-density commercial uses are also interested in good access to pedestrian traffic. To achieve this, good site design will typically include:

- operating front doors and windows,
- direct sidewalks to the street,
- sidewalks between buildings, and
- sidewalks to parking areas.

To further improve access to both pedestrians and to those in automobiles, these land uses may also require:

A wide amenity zone is useful in pedestrian-oriented developments.

- wider sidewalks (8' minimum in high activity areas),
- sidewalk amenity zones,
- higher quality street furnishings, and
- on-street parking.

These land uses also can benefit from access to transit riders and bicyclists. Even so, property owners or managers may express concern about the appropriate locations and maintenance of bus stops and bike racks, if they feel that these design elements are unsightly or are blocking their building entrances.

A wide sidewalk, awnings and pedestrian-scale lighting enhance the pedestrian environment. The planting strip provides a buffer from traffic, since on-street parking is not feasible.

Assessing Tradeoffs: Complementary and Competing Stakeholder Perspectives

Clearly, some design elements will be deemed beneficial to all adjacent "neighbors" and even to the various types of travelers along the street. Sidewalks, bike lanes, and planting strips may fall into this category, for example. More often than not, however, different stakeholders will express different interests or perspectives related to "good" street design. This means that some design elements will benefit some users more than others and that some design elements that benefit one user group may actually work to the detriment of other users. That, along with the likelihood of right-of-way constraints, heightens the need to thoroughly assess tradeoffs between different perspectives during the design process.

Chapter 3 describes a process for planning and designing streets that incorporates an assessment of those tradeoffs. The matrix shown in Figure 2.1 (beginning on page 30) offers additional information for assessing tradeoffs among street design elements that various stakeholders may prefer. The matrix shows which design elements may enhance certain stakeholders' experiences and relates those design elements to other stakeholders' expectations. **The matrix is not intended to be a comprehensive treatment of all aspects of street design and the tradeoffs inherent in them. Rather, it offers examples that a design team can consider to solve a variety of design issues in constrained environments. The design team should use this matrix to help document their discussions of the decisions made during Step 6 of the design process described in Chapter 3. For intersection projects, the design team should follow the guidelines described in Chapter 5 and Appendices A and B for assessing level-of-service (LOS) for pedestrians and bicyclists for different intersection types.**

Note that the matrix treats "transit" from the Transit Drivers' perspective. since riders share the characteristics and expectations discussed for other pedestrians.

Figure 2:1

Design Element Matrix – Different User Perspectives

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Pedestrians Want Buffering from Cars						
Consider some mix of the following elements to create a buffer:						
Planting Strip	The wider the better, since wider strips allow trees to grow	◆	◆	◆	◇	◆
Amenity Zone	Use where high pedestrian volumes are likely, particularly in combination with on-street parking	◆	◇	◆	◆	◆
Wide Sidewalk	Back-of-curb (6' min.) may be allowable in retrofits, if combined with bike lane or on-street parking	◆	◇	◇	◇	◆
Bike Lanes	Provide "extra" buffering, in combination with other elements	◆	◆	◆	◆	◆
On-Street Parking	Helps shield pedestrians from moving traffic	◆	◆	◆	◆	◆
Trees	Need a 6'-8' minimum planting strip or treewells in amenity zone; 8' is the minimum for large maturing trees	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Pedestrians Want Safe and Comfortable Walkways						
The following elements impact pedestrians' comfort and safety:						
Adequate Sidewalk Width	5' is minimal width for two people to pass comfortably; ADA also supports 5' minimum; in higher volume locations, provide wider sidewalks	◆	◇	◇	◇	◆
Solid Surfaces	Minimize grates and other uneven surfaces	◆	◇	◇	◆	◆
No Sidewalk Obstructions	Utility poles and street furnishings should never be in the sidewalk; sidewalk width should be unobstructed	◆	◇	◇	◇	◇
Few Driveways	Reduce potential conflicts between pedestrians and turning vehicles; particularly important in Main Street settings or on "commercial/ retail" blocks	◆	◆	◆	◆	◆
Vertical Curbs	Separate the vehicle zone from pedestrian zone; mountable (valley) curbs increase the likelihood that cars will park on all or a portion of the sidewalk	◆	◆	◇	◇	◇

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Pedestrians Want Personal Security						
Consider the following elements to reduce pedestrians' vulnerability:						
Pedestrian Scale Lighting	More than just aesthetics, this identifies a "pedestrian area" and can fill gaps between street lights	◆	◆	◆	◆	◆
Street Lighting	If pedestrian scale lighting not provided, this becomes more important	◆	◆	◆	◆	◆
Other Pedestrians	Having other pedestrians around increases the number of "eyes on the street"; not a design element, but good streets and the right land uses tend to encourage more pedestrians	◆	◆	◇	◇	◆
Buildings Oriented onto Street	Must include windows and doors facing street for more "eyes on the street"	◆	◆	◆	◆	◆
Planting Strip	Provides extra separation between pedestrians and cars	◆	◆	◆	◇	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Pedestrians Want Aesthetics and "Things to Look At"						
The following are examples of ways to enhance the walking environment; they also can help with security issues:						
Trees and Landscaping	Provide a more attractive walking environment; 8' minimum planting strip for large maturing trees	◆	◆	◆	◇	◆
Street Furnishings (not blocking sidewalk)	Benches, fountains, kiosks, etc. reduce monotony, as well as serving specific functions	◆	◆	◇	◆	◇
Buildings Oriented onto Street	Reduce the "blank wall" effect and provide stopping opportunities	◆	◆	◇	◆	◇
Variable Building Facades	Reduce the "blank wall" effect	◆	◆	◇	◇	◇
Ground Floor Activity	Arrange buildings to encourage a high level of activity for the pedestrian to observe or participate in; also enhances security	◆	◆	◇	◇	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Pedestrians Want Protection from the Elements						
The following can provide some protection against the elements:						
Trees	Can serve as windbreak, if evergreen; deciduous trees provide shade in summer. Must have 8' minimum planting strip for large maturing trees	◆	◆	◆	◇	◆
Awnings	Clusters of awnings can combine with trees to create shade, as well as opportunities for shelter	◆	◇	◇	◇	◆
Bus Shelters	Provide pedestrians opportunities for shelter	◆	◇	◇	◆	◇
Arcades	Ground floor "promenades" can create a totally sheltered outdoor area	◆	◇	◇	◇	◆
Pedestrians Want Direct Connections						
The following can provide more direct connections and potentially shorter routes, which is particularly important for pedestrians:						
Complementary Land Uses	Providing more pockets of complementary uses makes walking more likely for more people	◆	◆	◆	◆	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Short Blocks	Provide more route options, shorter routes, and more opportunities for safe crossings	◆	◆	◆	◆	◆
Mid-Block Crossings	Where blocks are very long, people need safer crossings between signals; must be appropriately applied - shorter blocks are generally preferable	◆	◆	◆	◆	◆
Pedestrians Want Safer Crossings						
Safer crossings can be achieved through combinations of the following: (See also CDOT's Pedestrian LOS in Appendix B and Mid-Block Crossing Policies for a more comprehensive discussion)						
Mid-Block Crossings	Must be carefully applied to be safe; should be combined with other features	◆	◆	◆	◆	◆
Refuge Islands	Should be 6' minimum to provide sufficient space and separation from traffic lanes	◆	◆	◆	◆	◆
Medians	Provide a pedestrian refuge, if wide enough; consider hardscape at likely crossing spot; may also increase vehicle speeds, though	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Curb Extensions	Reduce crossing distances and may also serve to reduce vehicular speeds	◆	◇	◇	◇	◆
Pedestrian Countdown Signals	Let pedestrians know how much "crossing time" is available; use in combination with enhanced crosswalks and other features	◆	◇	◇	◇	◇
Neckdowns or Street Narrowing	The less pavement to cross at one time, the better	◆	◇	◇	◇	◆
Small Curb Radii at Intersections	Reduce the crossing distance and vehicle turning speeds by creating tighter turns	◆	◇	◇	◆	◇
Cyclists Want Designated Space						
The following can help create designated space for cyclists (note that designated space is typically more important for casual cyclists than for experienced cyclists):						
Bike Lanes	Particularly needed by casual cyclists on higher-volume, higher-speed streets; 4' minimum, 5' preferred	◆	◆	◆	◆	◆
Bike Boxes at Intersections	Should only be used in conjunction with a bike lane; even if absent from rest of segment, add bike lane on the intersection approach	◆	◆	◇	◇	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Wide Outside Lanes (wosl)	Use as last resort, because generally inappropriate; extra wide lanes might increase traffic speeds; may be allowable if no space for full bike lane; better with edge line	◇	◇	◇	◆	◇
Edge Line	Can better define bike space, if wosl must be used; may also help better confine traffic, though calming benefits unproven	◆	◆	◇	◇	◇
Pavement Markings	Can be particularly useful with wosl's; consider, e.g., the "Denver Arrow" or "Sharrow"	◇	◆	◆	◆	◇
Traffic Calming	Both casual and experienced cyclists may feel more comfortable operating in mixed traffic on lower volume, lower speed streets; for specific calming tools, see CDOT's Traffic Calming Report	◆	◆	◇	◇	◆
Cyclists Want Safer Riding Environment						
To encourage cycling, consider the following to enhance safety:						
Smooth Surfaces	Provide smooth seams between asphalt and gutter; drainage grates should be bike friendly (no parallel-running grates)	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Street Lighting	Bike lights more useful for visibility to drivers than for lighting the way	◆	◆	◆	◆	◇
No On-Street Parking	Opening car doors create potential hazard; however, wide bikes lanes alleviate this hazard	◇	◆	◇	◆	◇
Separation from On-Street Parking	If on-street parking is used, either parking lane or bike lane should be wider than minimum	◇	◆	◆	◆	◇
No Front-In Angle Parking	Seriously limits cyclists' visibility to drivers; however, reverse angle parking alleviates this hazard	◇	◆	◇	◇	◇
Reverse Angle Parking	Puts cyclist in drivers' sightline, but also requires more space and buffering than parallel parking	◇	◇	◆	◇	◆

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Cyclists Want Safer Crossings						
Consider the following elements to increase cyclists' visibility:						
Bike Boxes	Brings cyclists into drivers' sight; allows cyclists a headstart through an intersection; should provide bike lane approaching intersection	◆	◆	◆	◆	◇
Drop Bike Lane at Intersection	Achieves same as bike box, but without designated space; casual cyclists may feel less comfortable, although it is considered safer to drop the lane and have cyclists merge earlier for left-turns if there is no bike box	◆	◆	◆	◆	◇
Leading Bike Signal	Allows cyclists a headstart through the intersection; requires driver and cyclist education	◆	◆	◆	◆	◇
Short Blocks	Create more intersections, but potentially smaller intersections; more opportunities to avoid high volume routes; can potentially calm traffic and allow more opportunities for safe crossing treatments	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Bike-Sensitive Signals at Intersections	If cyclists can't trip the signal, they're more likely to make unsafe movements	◆	◆	◆	◆	◇
Roundabouts	Slow down motor vehicles at intersections; "equalize" speed of bikes and cars; multiple lane roundabouts more difficult to traverse than single lane roundabouts	◆	◆	◆	◆	◇
Pedestrian Refuges	For casual cyclists, the ability to cross partway and wait may enhance perception of safety; should be 6-8' minimum width to shelter cyclists	◆	◆	◆	◆	◆
Cyclists Want Direct Connections						
The following elements can affect the cyclists' ability to find direct, easy connections:						
Short Blocks	Provide more route options, shorter routes, and more opportunities for safe crossings	◆	◆	◆	◆	◆
Bike/Ped Travelways	When local street connections (preferred) aren't possible	◆	◆	◇	◇	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Cyclists Want Security						
Cyclists are more likely to be or feel vulnerable than are motorists; consider the following elements to enhance cyclists' security:						
Roundabouts	Help reduce the number of stops a cyclist must make	◆	◆	◆	◆	◇
Bike-Sensitive Signals at Intersections	If cyclists can't trip the signal, they're more likely to make unsafe movements	◆	◆	◆	◆	◇
Pedestrian Scale Lighting	Helps identify an area as pedestrian and cyclist friendly; provides additional lighting	◆	◆	◆	◆	◆
Street Lighting	Cyclists can more easily see potential dangers in and along the street	◆	◆	◆	◆	◆
Bike Lockers	Providing storage options at appropriate locations can make the difference between whether a cyclist is able to use this mode; not strictly a street design feature	◇	◆	◇	◆	◆
Bike Racks	Provides similar advantages as, though more exposed than, lockers; either treatment needs to be readily accessible to surrounding land uses; not strictly a street design feature	◇	◆	◇	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Motorists Want Reduced Delays/Increased Capacity						
The following elements can increase a street's capacity and/or potentially reduce motorists' delay:						
More Travel Lanes	Each additional travel lane increases the street's capacity, especially at intersections; the mix of through and turn lanes can, up to a point, allow an intersection to process more traffic	◆	◇	◆	◆	◇
Design Consistency	By providing a consistent design (number of travel lanes, i.e.), motorists don't have to unexpectedly stop or merge; however, this may be difficult to achieve	◇	◇	◆	◇	◆
Grade Separated Intersections	Allows uninterrupted flow; particularly useful for high volume intersections, but destroys urban context for other users	◆	◇	◆	◇	◆
Unsignalized Intersections	May mean less delay for the higher-volume leg, but more delay for the lower-volume leg; in general, fewer signals means less delay on thoroughfares, but may also mean less connectivity	◇	◇	◇	◆	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Signal Timing & Phasing, Progression	Signals can be phased and timed to reduce vehicular delay overall or by approach; progression may help reduce delay along higher-volume streets	◆	◇	◆	◆	◇
Roundabouts	Allow more traffic to flow through an intersection in a given period of time than with either unsignalized or signalized intersections; for all users, dual lane roundabouts less easy to navigate than single lane roundabouts	◇	◆	◆	◇	◇
Turn Lanes	Left turn lanes, in particular, allow through traffic to continue to move; at signalized intersections, creating separate phases along with turn lanes may increase overall delay	◇	◇	◆	◆	◇
Dual Left Turn Lanes	Can increase intersection's capacity to process traffic; creates wider intersections, but can also allow more efficient signal timing for other traffic movements	◆	◇	◆	◆	◇
Bus Pullouts	Remove stopped buses from travel lanes; bus drivers may find it difficult to re-merge into traffic	◇	◇	◆	◇	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Motorists Want Safety						
The following elements are traditionally assumed to increase motorists' safety:						
Wider Lanes	May provide drivers more room for error; however, in combination with other features, may also increase speeds, because drivers feel more comfortable driving faster	◆	◆	◆	◆	◆
Clear Zone	Removing objects for some distance from the travel lanes improves sight distance and leaves room for error; but this may also increase speeds	◆	◆	◆	◆	◆
Increased Sight Distance	Increasing sight distance can improve overall visibility; appropriate sight distance depends on type of traffic control at intersections, speeds, and context; application should vary by intersection type	◇	◆	◆	◆	◆
Medians	Separate opposing traffic streams and minimize vehicle/vehicle and vehicle/pedestrian conflicts; but may increase traffic speeds	◆	◆	◆	◆	◆
Turn Lanes	Turn lanes, particularly for left turns and on higher-speed streets, reduce the potential for rear-end collisions	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Street Lighting	Increases visibility and potentially reduces conflicts	◆	◆	◆	◆	◇
Motorists Want Speed						
The following elements may allow motorists to travel at higher speeds:						
Wide Travel Lanes	Combined with total cross-section width and straightness of street, may make drivers feel more comfortable driving at higher speeds	◇	◇	◆	◆	◇
Clear Zone	Removing objects for some distance from the travel lanes improves sight distance and may make drivers feel more comfortable driving at higher speeds	◇	◇	◆	◆	◇
Lack of Street Trees	In combination with other elements listed above, may make drivers more comfortable driving at higher speeds because of increased sight distance;	◆	◆	◇	◇	◆
Wide Overall Cross-section	A wide street, with few visible obstructions, tends to make drivers feel comfortable driving at higher speeds	◆	◇	◇	◇	◆

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Medians	Separating opposing traffic streams may make drivers feel more comfortable driving at hgher speeds	◆	◆	◆	◆	◆
Consistent Vertical and Horizontal Alignment	Straighter and flatter streets typically encourage motorists to drive faster	◆	◆	◆	◆	◆
Large Curb Radii at Intersections	Allow motorists to make sweeping turns, meaning they can turn at a higher rate of speed	◆	◆	◆	◆	◆
Motorists Want to Minimize Conflicts						
Minimizing conflicts is related to both safety and speed; the following elements can help minimize conflicts:						
Medians	Provide a buffer between opposing traffic streams; can help create higher speeds; requires more right-of-way and can limit access to adjacent land	◆	◆	◆	◆	◆
Grade Separated Intersections	Allow traffic to continue with little delay and exposure to conflicting traffic movements, but destroys urban context for other users	◆	◆	◆	◆	◆
Bike Lanes	Take cyclists out of travel lanes, easing motorists' confusion	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Sidewalks	Provide a separate space for pedestrians; keep them away from travel lanes, particularly when combined with other buffers	◆	◆	◆	◆	◆
Access Controls	Reduce the incidence of vehicles slowing and turning into/out of driveways; however, can limit direct access to land uses	◆	◆	◆	◆	◇
Signalization	Signal controlled intersections help limit direct vehicle/vehicle and vehicle/pedestrian conflicts	◆	◇	◇	◇	◇
The requirements of transit drivers differ from those of transit riders; riders have basically the same perspective as other pedestrians; drivers have basically the same perspective as drivers of other large vehicles						
Transit Drivers Want Space to Maneuver						
The following elements can provide the space for buses (and other large vehicles):						
Wide Travel Lanes	12' feet preferred by transit operators	◇	◇	◆	◆	◇
Large Curb Radii at Intersections	Allow buses to turn more easily, by creating space for "sweeping" turns	◆	◇	◆	◆	◇

◆ - Positive Impact ◆ - Negative Impact ◇ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2:1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Clear Zone	A clear zone between the travel lane and parked cars, utility poles, and trees reduces the likelihood of side mirrors hitting objects	◆ Mixed	◆ Mixed	◆ Positive	◆ Positive	◆ Mixed
Mountable Curbs on Medians or Corners	Allow bus drivers to maneuver around corners, if curb radius is too tight	◆ Negative	◆ Positive	◇ Neutral	◆ Positive	◆ Mixed
Transit Drivers or Passengers Want Access to Loading/Unloading Passengers						
Some of the following elements refer to the drivers' perspective, others to the passengers' perspective:						
Waiting Pads	Provide a hard surface and designated waiting and loading area for passengers, if there is no sidewalk and/or amenity zone	◇ Neutral	◇ Neutral	◇ Neutral	◆ Positive	◇ Neutral
Curb Extensions	Allow passengers direct access off of curb and onto bus; bus doesn't have to leave travel lane	◆ Positive	◆ Mixed	◆ Mixed	◆ Positive	◆ Positive
Amenity Zone	Bus passengers don't have to wait or walk on grass	◆ Positive	◇ Neutral	◆ Positive	◆ Positive	◆ Positive
Bus Shelters	Create a designated, comfortable waiting space for passengers	◆ Positive	◇ Neutral	◇ Neutral	◆ Positive	◆ Mixed

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

Figure 2.1

Design Element Matrix – Different User Perspectives (cont'd)

		Pedestrians	Cyclists	Motorists	Transit*	Neighbors
Street Furniture	Benches, trash cans, etc. can make waiting for the bus more comfortable	◆	◆	◇	◆	◆
Transit Riders Want Safety/Security						
The elements that provide security for transit riders and drivers are the same as those for pedestrians and motorists, respectively, with a few exceptions; waiting riders may feel more vulnerable than other pedestrians because they are stationary; the following can help:						
Appropriately Located Stops	Transit stops should generally be located in well-traveled, visible areas	◇	◇	◇	◆	◆
Pedestrian Lighting at Bus Stops	Clearly identifies the space and provides added visibility to and of the passengers; particularly important in less traveled areas	◆	◆	◆	◆	◆

◆ - Positive Impact ◆ - Negative Impact ◆ - Mixed Impact or Use With Caution ◇ - Neutral

* **Transit** — the matrix treats "transit" from the Transit Drivers' perspective, since riders share the characteristics and expectations discussed for other pedestrians.

3. APPLYING THE GUIDELINES

The previous chapter explained that various stakeholders have different expectations of what makes streets "good" or even "great". To appropriately apply the Urban Street Design Guidelines (USDG), the plan/design team must assess the expectations of a variety of stakeholders in order for streets to best reflect their contexts and intended functions. This assessment is also intended to ensure that the resulting streets are "complete" streets – streets that provide for the safety and comfort of all users to the best extent possible.

The purpose of this chapter is to explain how the perspectives of all stakeholders interested in or affected by existing or future streets will be incorporated into a new process for planning and designing streets in Charlotte's Sphere of Influence. The new process described in this chapter consolidates traditional city planning, urban design, and transportation planning activities into a sequence of fact-finding and decision-making steps.

The application of the new process for planning and designing streets is intended to support the creation of "more streets for more people." This overriding goal of the USDG will require achieving the following changes:

1. Ensuring that the perspectives of all stakeholders interested or affected by streets are seriously considered during the planning and design process for existing or future streets;
2. Defining a clear sequence of activities to be undertaken by staff, consultants and stakeholders;
3. Remembering that this will be a process that is much more geared toward what we want to happen in the future than just accepting what happened in the past or exists now;
4. Verifying that the inevitable tradeoffs affecting objectives, benefits, costs, and impacts are well documented so that the recommendations made by staff, consultants or stakeholders are based on understanding the direct effects on specific modes of travel and/or land use intentions; and
5. Always striving to create not only more streets, but also more complete streets that are good for all modes of travel, and even some great streets that are remarkable because of the very effective and favorable ways that the adjacent land uses and transportation functions of those streets support each other.

The process described in this chapter provides a great deal of flexibility to those involved in the decision-making process, to ensure that the resulting streets are appropriately based on the existing and proposed land use and transportation contexts. This flexibility

is intended to foster creative solutions by ensuring that land use planners, engineers, transportation planners and others work together to think through the implications of alternative street designs.

The six-step process shown in figure 3.1 and described below will primarily be applied to planning and designing the "non-local" street types – Main Streets, Avenues, Boulevards, and Parkways. In some cases, public projects that retrofit existing Local Streets may require the use of the six-step process and, when area plans are being prepared, both non-local and Local Streets will need to be specified.

The area planning process provides one of the best opportunities to integrate the planned land use and transportation characteristics on an area-wide basis, and the six-step process gives the framework for that integration. Even in the case of area plans, though, the level of specification will vary between Non-Local and Local Streets. Assuming that there is enough information available

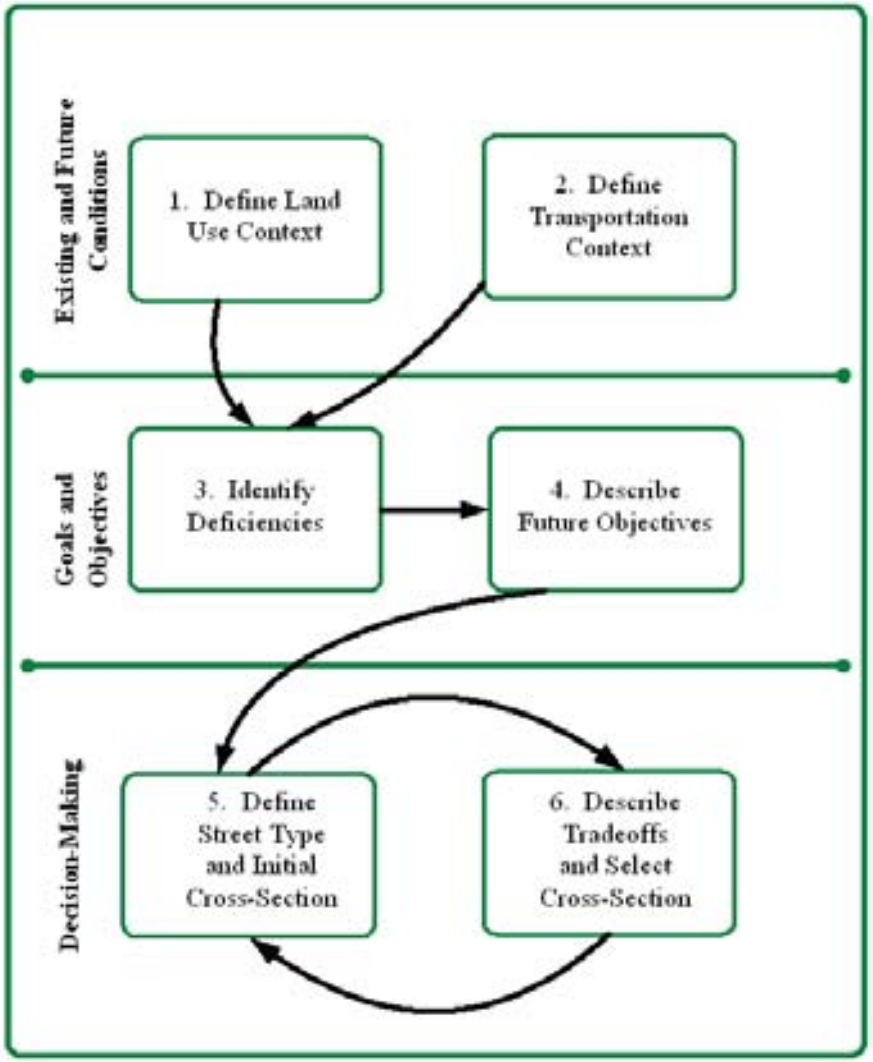


Figure 3.1. The Six-Step process for Applying Charlotte's Urban Street Design Guidelines.

about future land use context and future transportation context, the planning team would specify the actual cross-sections for all non-local streets in the area plan. For the Local Streets, the planning team would specify the spacing of the emerging Local Street network, and the specific cross-sections would be applied based on the adjacent land uses, as the streets are constructed.

For the most part, however, new Local Streets will be built through the land development process and the major design decision will be to select the appropriate pre-defined cross-section, as described in Chapter 4,rather than to apply the six-step process. Conversely, retrofitting a non-local street with limited right-of-way through an existing neighborhood will be more complicated and require more of a tradeoff analysis.

Applying the Guidelines: Six Steps

The remainder of this chapter defines a six-step process for developing the most appropriate design for streets in a variety of contexts. The following three assumptions are built into the six-step process:

1. The process will involve a variety of stakeholders. The number of stakeholders and discussions will vary, depending on the magnitude and consequences of the street(s) to be designed.

2. The resulting street will be as "complete" a street as possible, in order to meet the multi-modal objectives defined in the Transportation Action Plan.

3. The steps in the decision-making process will be well-documented. The documentation will clearly describe the major tradeoffs made among competing design elements, how those were discussed and weighed against each other, and the preliminary and final outcomes. Thorough documentation will ensure that all stakeholders' perspectives are adequately considered in the final design.

Figure 3.1 (previous page) shows the assessment steps to be included in applying the USDG. Each of the six steps is defined in more detail in the remainder of the chapter. **It is important to note that the steps described below can be applied either to a single street or to a collection of streets in an area (such as when an area plan is being developed).** In either case, the first four steps should take an area-wide approach to gathering and assessing the information required for each step, since even individual street segments do not exist or function in isolation from the surrounding street network and land uses.

Step 1: Define the Existing and Future Land Use and Urban Design Context

The classification and ultimate design of any street should reflect both the existing and expected future land use contexts. These existing and future contexts should be considered from the broadest, area-wide perspective down to the details of the immediately adjacent land uses. A street is likely to be classified and/or

designed differently if it is in an area slated for higher density development, such as a transit station area, versus in a neighborhood of single family houses, where very limited development changes are anticipated.

The following questions regarding the intensity and arrangement of existing and future land uses in the area surrounding the street to be designed should be addressed by the plan/design team:

- What does the area look like today?
- What are today's land use mixtures and densities?
- What are the typical building types, their scale, setbacks, urban design characteristics, relation to street, any special amenities, etc.?
- Are there any particular development pressures on the area (the nature of this may vary according to whether the area is a "greenfield" versus an infill area and this type of information is particularly important in the absence of an area plan)? What, if anything, can be gleaned from permit data, for example, about the nature of the emerging land use context?
- What are the "functions" and the general circulation framework of the neighborhood and adjacent areas?
- Is there a detailed plan for the area?
- If so, what does the adopted, detailed plan envision for the future of the area?
- Does the plan make specific recommendations regarding densities, setbacks, urban design, etc.?

The existing, auto-oriented transportation context surrounding the intersection of South Boulevard and Scaleybark Road. The future transportation context will change to include light rail transit and more pedestrian features to support a transit-oriented environment.

- Are there any other adopted development policies for the area?
- If so, what do those policies imply for the area?

Step 2: Define the Existing and Future Transportation Context

The transportation assessment should consider both the existing and expected future conditions of the transportation network adjacent to or affecting the street to be designed. The recommended design should reflect the entire transportation context (function, multimodal features, form), rather than that related strictly to capacity on a given segment.

The following questions regarding existing and future transportation conditions should be addressed by the plan/design team:

- What is the character of the existing street? How does the street currently relate to the adjacent land uses?
- How does the street currently function? What are the daily and hourly traffic volumes? Operating and posted speeds? What is the level-of-service (LOS) for pedestrians? Cyclists? Motorists?
- What are the current design features, including number of lanes, sidewalk availability, bicycle facilities, traffic control features, street trees, etc.?
- What, if any, transit services are provided? Where are the transit stops?
- What is the relationship between the street segment being analyzed and the surrounding network (streets, sidewalks, transit, and bicycle connections)?
- Are there any programmed or planned transportation projects in the area that would affect the street segment?
- Are there any other adopted transportation policies that would affect the classification of the street segment?

Step 3: Identify Deficiencies

Once the existing and future land use and transportation contexts are clearly

In these examples, there are significant gaps in the network along these streets. Note the worn footpaths and the fact that the bus stop on the right has no sidewalk to provide easy pedestrian access.

Left and Above: The street network surrounding this segment of Rea Road, in south Charlotte, is very disconnected, which has ramifications for motorists, bicyclists, and pedestrians.

defined and understood from an area-wide perspective, the plan/design team should be able to identify and describe any deficiencies that could/should be addressed by the new or modified street. This step should consider all modes and the relationship between the transportation and the land use contexts.

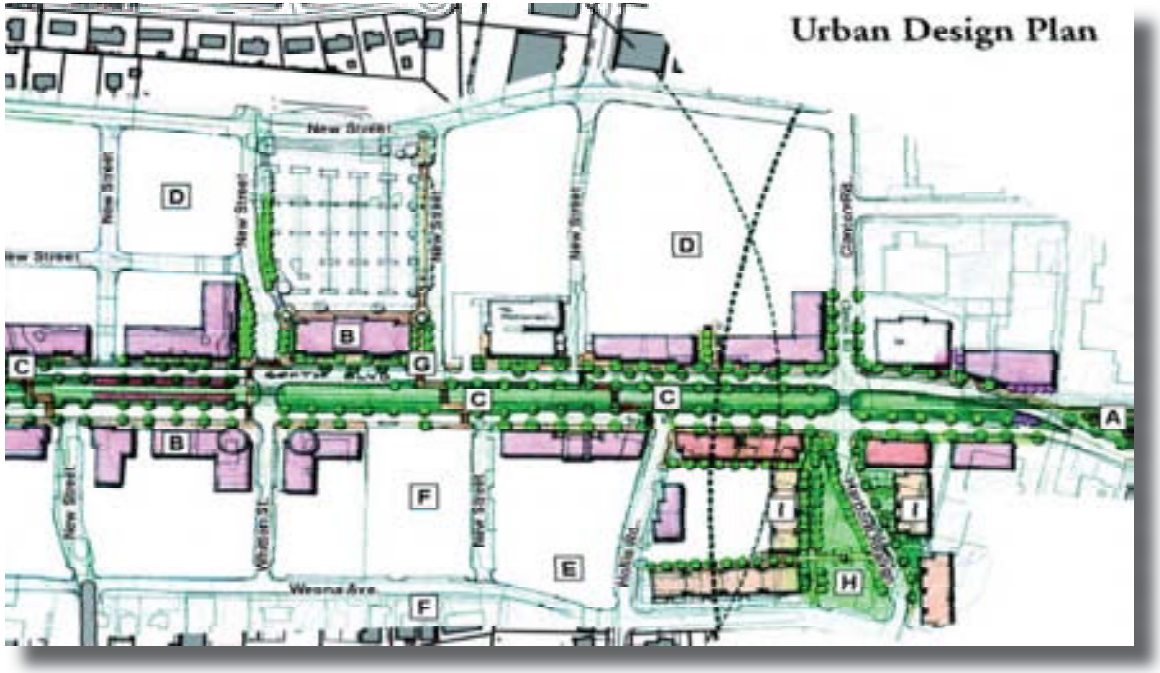
From the information provided in the first two steps, "deficiencies" might include, but are not limited to:

- Gaps in the bicycle or pedestrian network near or along the street segment;
- Gaps in the bicycle or pedestrian network in the area (which may increase the need for facilities on the segment, because of the lack of alternative routes);
- Insufficient pedestrian or bicycle facilities (in poor repair, poorly lighted, or not well buffered from traffic, e.g.);
- Gaps in the overall street network (this includes the amount of connectivity in the area, as well as any obvious capacity issues on other segments in the area);
- Inconsistencies between the amount or type of transit service provided along the street segment and the types of facilities and/or land uses adjacent to the street;
- Inconsistencies between the existing land uses and the features of the existing or planned street network.

Step 4: Describe Future Objectives

This step synthesizes the information from the previous steps into defined objectives for the street project. The objectives could be derived from the plans and/or policies for the area around the street, as well as from the previously identified list of deficiencies. The objectives will form the basis for the street classification and design.

In addition to the general intent of providing complete streets, the following

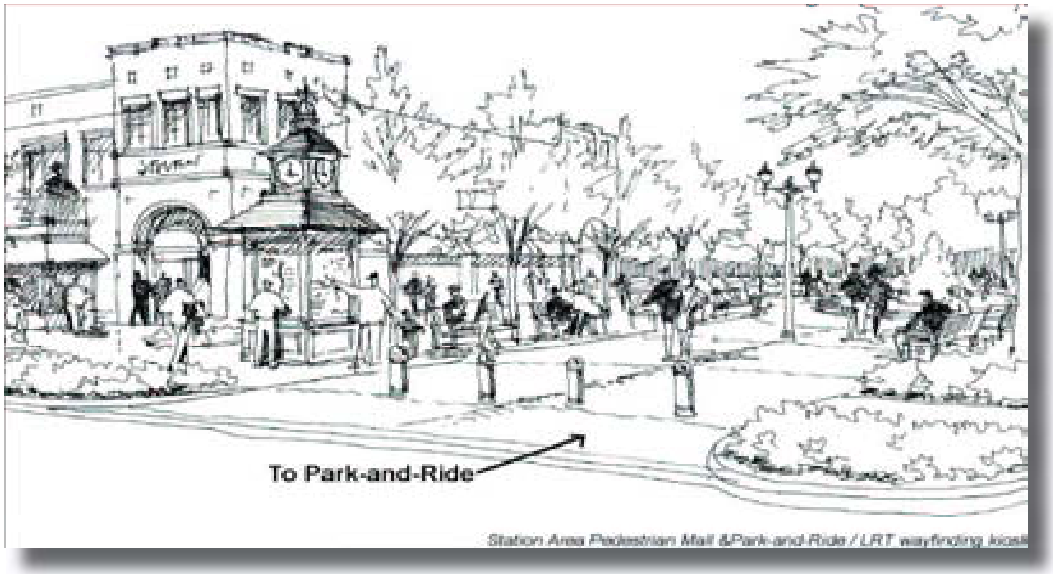


Above and Below: More detailed portions of the station area plan help to define the overall objectives for the area and its transportation network.

Above: A future plan for the Scaleybark Station Area incorporates the light rail transit line, the street network configuration, pedestrian connections, and land use and urban design into a transit-oriented area.

issues should be considered in defining the specific objectives:

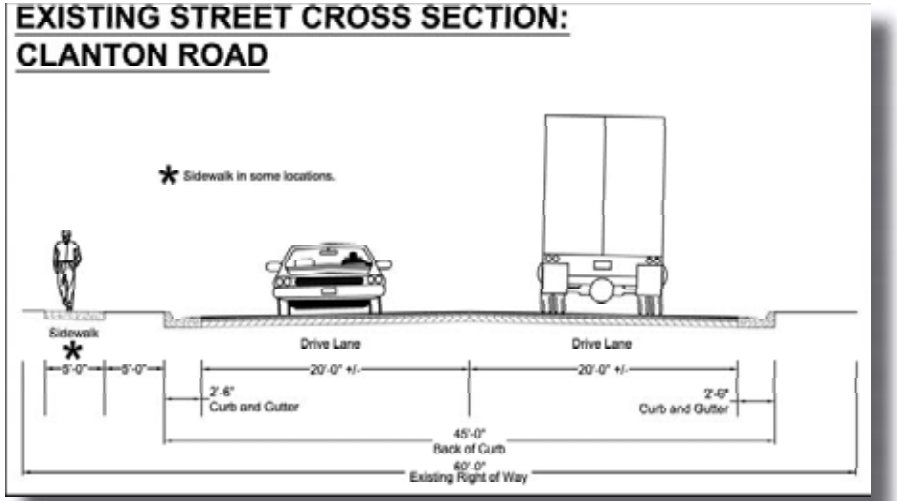
- What existing policies might or should influence the specific objectives for the street?

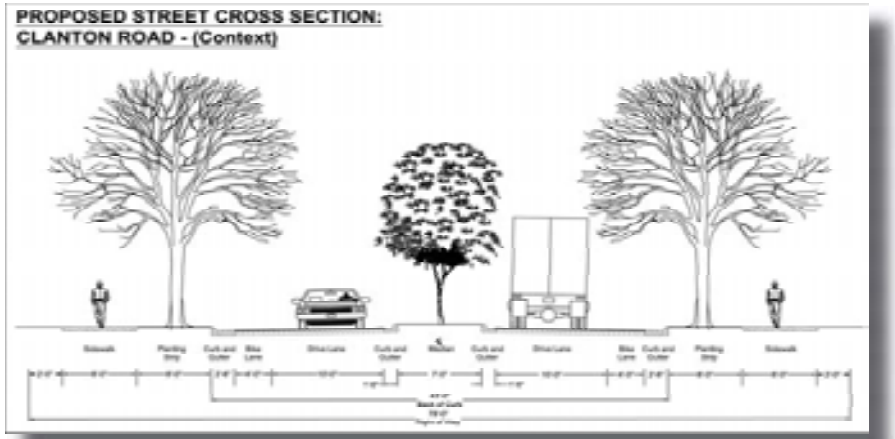


- What conditions are expected to stay the same (or, more importantly, what conditions should stay the same)?
- Would the community and the stakeholders like the street and the neighborhood to stay the same or to change?
- Why and how would the community and the stakeholders like the street and the neighborhood to change?
- Given this, what conditions are likely to change as a result of classifying the street (exactly how will the street classification and design support the stakeholders' expectations)?

Step 5: Recommend Street Classification and Test Initial Cross-Section

At this point, the plan/design team recommends the appropriate USDG street typology (or typologies, if several streets are being analyzed), based on the previous steps. The rationale behind the classification should be





The bottom drawing shows a possible cross-section for a portion of a street in a station area. The cross-section is significantly different from the existing cross-section shown at the top, and is intended to reflect the emerging context of transit and pedestrian-oriented areas along light rail lines.

documented. **This step should also include a recommendation for any necessary adjustments to the land use plan/policy and/or transportation plan for that area.** Since the street type and the ultimate design are defined, in part, according to the land use context, subsequent land use decisions should reflect and support the agreed-upon street type and design.

The initial cross-section should be defined based on the recommended street typology, keeping in mind that some typologies allow more than one option. Once the preferred option is identified, the ideal cross-section will typically include the design features with their preferred dimensions specified for that street type.

The initial cross-section should then be tested against the land use and transportation contexts and the defined objectives for the street project. At this point, any constraints to the provision of the initial, preferred cross-section should also be identified, including:

Here, the rolling hills, existing stands of mature trees, and creek crossings will all have an impact on the final cross-section chosen.

- Lack of right-of way,
- Existing structures,
- Existing trees or other environmental features,
- Topography, and
- Location and number of driveways.

This step should clearly identify which constraints may prohibit the use or require refinement of the initially defined cross-section.

Step 6: Describe Tradeoffs and Select Cross-Section

If the initial, "preferred" cross-section can be applied, then this step is easy: the initial cross-section is the recommended cross-section. In many cases, though, the initial cross-section will need to be refined to better address the land use and transportation objectives, given the constraints identified in Step 5. Sometimes, the technical team will develop more than one alternative design. **In that case, these multiple alternatives should be presented to the stakeholders.**

Any refinements to the initial cross-section (or alternatives) should result from a thoughtful consideration of tradeoffs among competing uses of the existing or future public right-of-way. The tradeoffs should be related to the requirements of each group of stakeholders and the variety of design elements that can best accommodate those requirements. The matrix at the end of Chapter 2 provides a listing of the general expectations of

various stakeholders about streets and the elements that might achieve those expectations. *At the least,* the requirements and elements listed in that matrix should be considered in any tradeoff discussion, though that list should not be considered comprehensive.

The specific method of evaluating the tradeoffs is left open to the plan/design team, as long as the method/discussion/analysis is documented. All perspectives should receive equal consideration and accountability in the plan/design process. Proper documentation will also generate information useful for future street design projects that might have similar characteristics, objectives, or constraints.

Once the tradeoffs are evaluated, the team should be able to develop a refined cross-section and suggested design treatments. The culmination of all of the previous steps, including any additional stakeholder comments, should provide sufficient rationale to select the design alternative that best matches the context and future expectations for the street project.

Final Comments on the Six Steps

The steps outlined in this chapter suggest that there is a linear process leading to an ideal solution. Realistically, in some instances the process may not follow the exact sequence described above. Some information may not be available or even be applicable for some conditions. **The intent, though, is to ensure that the existing and future contexts are given adequate consideration, that any related plans are modified to reflect the outcome, and that all perspectives are given equal consideration in the process.**

The same approach described here for large-scale street projects can be applied to smaller-scale or short-term projects or processes. In those cases, an "abbreviated" version of the six steps can be used to reach decisions that will necessarily involve a shorter timeframe or fewer stakeholders, but for which it is still important to consider all perspectives and document any necessary tradeoffs. The intent is to apply this thought process to the design of our emerging complete street network, whether through the full six-step process, or through the abbreviated version.

METRO Louisville

Complete Streets Manual

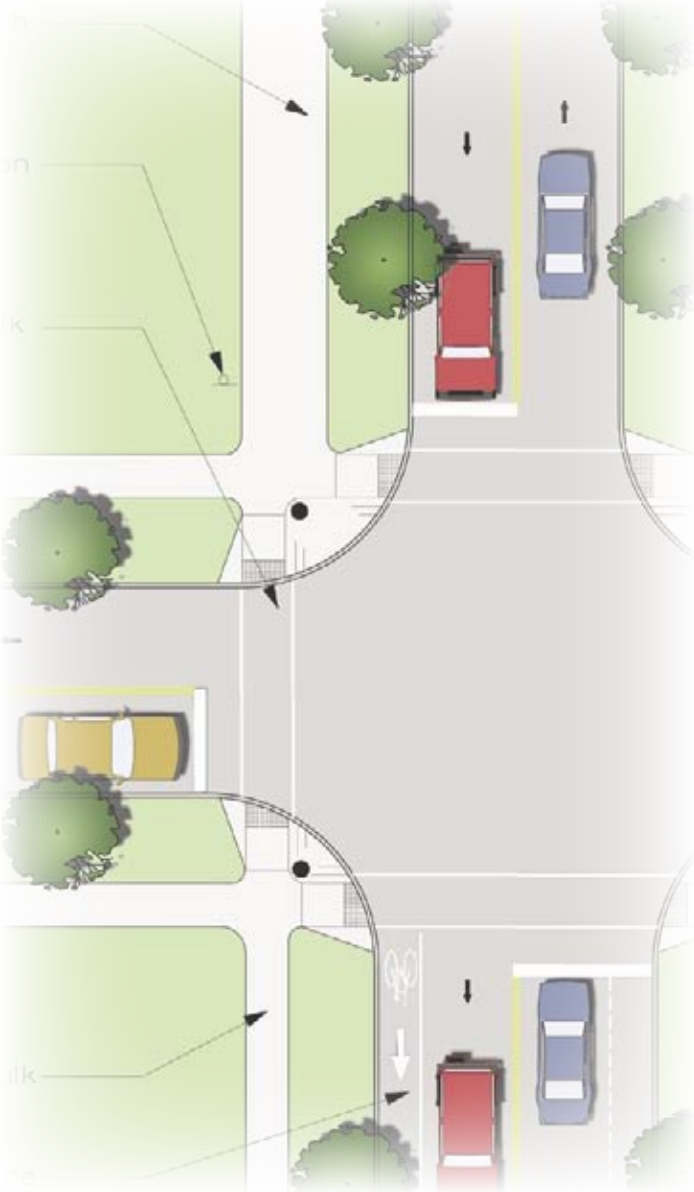


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Table of Contents

Chapter 1 - Purpose and Applicability 1
Chapter 2 - Design Framework 5
Chapter 3 - Users and Facilities 11
Chapter 4 - Facility Design 21
Chapter 5 - Streetscape Design 45
Chapter 6 - Streetscape Master Plan Manual 52
Glossary 56
References 62
Appendix 64

Chapter 1: Purpose and Applicability

Complete Streets Policy

Louisville Metro's transportation system shall accommodate and balance a broad range of factors within all transportation and development projects, both new and retrofit, including design, planning, maintenance, and operations, for the entire right of way. The goal of this policy is to develop a multi-modal network that manages the demand for travel and improves the efficiency of the community's transportation system as envisioned in Cornerstone 2020. This policy ensures that the following objectives are achieved in future transportation projects:

A Complete Street serves all transportation users

1. Bicycle and pedestrian ways shall be established in new construction and reconstruction projects unless one or more of three conditions are met:

- bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to accomodate bicyclists and pedestrians elsewhere within the right of way or within the same transportation corridor.
- the cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty percent of the cost of the larger transportation project. This twenty percent figure should be used in an advisory rather than an absolute sense.
- where the street has severe topographic or natural resource constraints.

2. In rural areas, shoulders should be included in all new construction and reconstruction roadway projects unless the addition of shoulders is constrained by existing topographic and/or natural features. Shoulders have safety and operational advantages for all road users in addition to the potential future use as facilities for bicyclists and pedestrians as rural roads develop.
3. Sidewalks, shared-use paths, street crossings (including over- and undercrossings), pedestrian signals, signs, street furniture, transit stops and facilities, and all connecting pathways shall be designed, constructed, operated, and maintainted so that all pedestrians, including people with disabilities, can travel safely and independently.
4. The design and development of the transportation infrastructure shall be designed to be sensitive to its context and character of the built or natural environment.
5. The design and construction of new facilities that meet the criteria in item 1 above should anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements. For example, a bridge that is likely to remain in place for 50 years might be built with sufficient width for safe bicycle and pedestrian use in anticipation that facilities will be available at either end of the bridge even if that is not currently the case.
6. The design and construction of new transportation infrastructure shall address the need for bicyclists and pedestrians to cross corridors as well as travel along them. Even where bicyclists and pedestrians may not commonly use a particular travel corridor that is being improved or constructed, they will likely need to be able

This Manual furthers Cornerstone 2020 Community Form Objectives C2.5, D2.4, E2.4, F2.4, G2.4, H2.1, H2.4, H2.5, J2.1, and J4.1, and H2.5; Mobility Objectives A3.1, D1.2, D1.3, E1.1, E1.2, H1.5, H2.2, H2.5, H2.6, H3.1, I2.1, and I3.1, and; Plan Element Policies 3.1, 3.12, 6.2, 8.4, 8.12, 9.1, and 9.2

Improved streets originally included all forms of transportation
Source: Photographic Archives, Ekstrom Library, University of Louisville

to cross that corridor safely and conveniently. Therefore, the design of intersections and interchanges shall accomodate bicyclists and pedestrians in a manner that is safe, accessible, and convenient.
7. New transportation and reconstruction projects shall adhere to design criteria identified within the Complete Streets Manual.

Purpose

Streets are an integral component of the Louisville Metro landscape. They play a vital role in both the social and economic health of this community by linking people, goods and services. The purpose of the Louisville Metro Complete Streets Manual (referred to as the Manual in the rest of the document) is to establish procedural and technical guidelines for developing a thoroughfare system that provides for safe and effective access to all users in a context-appropriate manner.

Louisville Metro first made a commitment toward a "complete streets" policy with the adoption of Cornerstone 2020, the community's comprehensive plan for growth and development. This Manual advances objectives and policies of both the Mobility and Community Form goals by addressing streetscape design in context with the existing character of the community. Furthermore, chapter 6 of this document serves as the Streetscape Design Manual referenced in Chapter 10, Part 6 of the Louisville Metro Land Development Code (LDC).

Louisville Metro's commitment to a "complete streets" policy is intended to promote the design of transportation corridors that are safe and convenient for pedestrians, bicyclists, motorists, and bus riders of all ages and abilities. The Manual will serve as a guide for Louisville Metro residents, interest groups, policy-makers, developers, designers, and agency staff to improve the function and character of our roads and roadway corridors.

Background

It was the growing popularity of the bicycle, not the automobile, that initially heightened interest in road development in this country. The Office of Road Inquiry was established in the early 1890's to promote the development of rural roads to serve wagons, coaches, and bicycles. (About.com, "How the Wheels Got Turning, a Historical Perspective on American Roads.")

With the introduction of the Model-T in 1908, the automobile quickly claimed supremacy of the road, changing the form and function of the street and its surrounding landscape or 'streetscape'. The desire to move vehicular traffic as efficiently and effectively as possible has dominated the design of streets and streetscapes for nearly a century.

For many Louisvillians, transit is their primary means of travel

A new trend in design of transportation corridors has emerged in response to a changing culture that is demanding more transportation choices. The emphasis on active lifestyles, energy conservation, and the importance of accommodating users of all ages and abilities illustrates that a streetscape will no longer be designed just for the automobile. Many communities, including Louisville Metro, are implementing variations of a "complete streets" policy.

Local Perspective

There is a demonstrated need for more modal choices and accessible roadways within this community. In 2005, 30.5% of Jefferson County's residents did not have a motor vehicle license (KY State Data Center). One can assume that these residents are using some other form of transportation to get to their destinations. According to Transit Authority of River City (TARC) statistics, 60% of Louisville Metro's transit riders are fully dependent on public transit. Demand for a system, accessible to all users that gives Louisville Metro residents more options to meet their travel needs, is evident.

Well designed streetscapes also contribute to an increased quality of life, which includes a more active lifestyle. In 2005, Metro Louisville Mayor, Jerry Abramson launched the Healthy Hometown Initiative. This initiative called for new strategies to increase access to and availability of opportunities for active living and to eliminate design and policy barriers that reduce choices for active living.

Applicability

The guidelines contained in this Manual shall apply to every development site adjacent to an existing or proposed public or private roadway. For the purpose of this Manual, a public roadway is defined as a road, thoroughfare, alley, highway, or bridge under the jurisdiction of a public agency. Private roadways would include a road, thoroughfare, alley, or bridge within an access easement that is privately owned and maintained.

All design guidelines should be implemented in accordance with the regulatory requirements contained in the Louisville Metro LDC and any neighborhood or small area plan, corridor study, or similar planning study adopted by the Planning Commission and/or the applicable legislative body.

The complete street design guidelines shall be applied to both new and retrofit transportation projects, including design, planning, maintenance, and operations, for the entire right of way. Complete street design guidelines shall include:

- adequate Right-of-Way for future bike lanes on road corridors where vehicular design speed and average daily trip (ADT) volumes warrant
- adequate Right-Of-Way or easements for multi-use trails and/or sidewalks
- easements for shared access and/or crossover access between lots for future or current connections
- easements for transit facilities, street lighting, benches, or similar facilities
- landscape areas

In addition to land area requirements, site specific

Bike racks are being designed by artists to reinvigorate downtown while supplying on-street bike parking

complete street design guidelines may include the installation and maintenance of the following streetscape features:

- Streetscape plantings
- Streetscape furnishings (e.g., benches)
- Bike racks/lockers
- Sidewalks and shared-use trails
- Transit stops/shelters
- Street lights

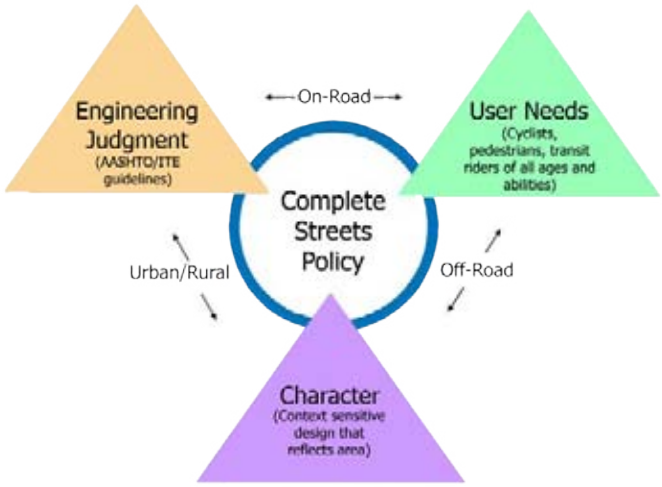
Review and Approval

New and retrofit street projects shall be reviewed for compliance with the Louisville Metro Complete Streets policy under the perview of the Department of Public Works and Assets. For retrofit projects, design flexibility shall be permitted based on existing constraints such as limited right-of-way, existing development patterns, context, topography, etc.

Chapter 2: Design Framework

Roadway and Roadside

A "complete street" is made up of two distinct areas—the roadway and the roadside. The Roadway is measured from the face of curb or pavement edge to the opposite curb or pavement edge. The Roadside includes the land area from the face of curb or pavement edge to the face of the adjacent building or structure (see figure below). The roadside typically includes a portion of the legal boundary of the road (in the form of Right-of-Way or access easement) and a portion of private property that adjoins the roadway. This Manual provides design guidelines relating to all activities occurring within a complete street.

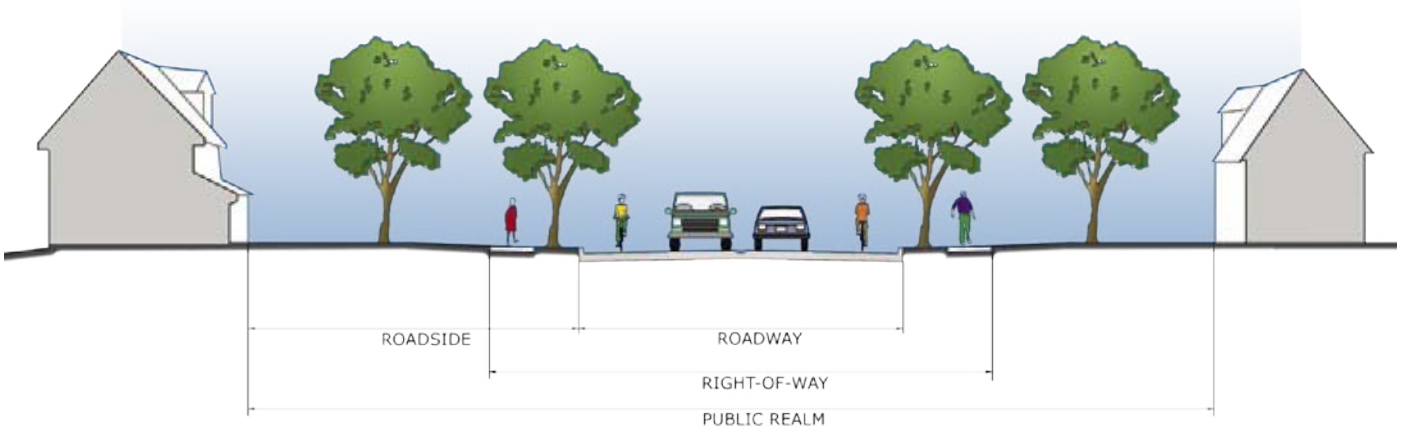


Relationship of Engineering, Character and Users

Relational Elements

Complete street design is both an art and a science. As such, good design standards balance sound engineering judgment and user needs within the context or character of the environment (see figure right). These three influences and the ways in which they relate serve as the design framework for the guidelines contained in this Manual.

Roadway design must clearly rely on the design professionals' knowledge and understanding of the elements associated with it. Travel speeds, volumes, horizontal/vertical alignments, and sight lines are a part of the complex variables that must be considered in roadway design. Engineering judgment is supported



Local Level Complete Street Illustration

by a significant body of resources including the U.S. Transportation Federal Highway Administration's (FHWA) standards and guidelines, American Association of State Highway and Transportation Officials (AASHTO) guidelines, and documents by the Institute of Transportation Engineers (ITE). The practices followed include the roadway classifications used by the Kentucky Transportation Cabinet (KYTC), Kentuckiana Regional Planning and Development Agency (KIPDA), and Louisville Metro LDC standards. This Manual should only be considered in conjunction with these existing standards and guidelines.

User needs are the second influence to be considered in the design of a "Complete Street." Many of the facilities contained within the right-of-way are uniquely associated with motorists, pedestrians, transit riders, and cyclists of varying ages and abilities. Chapter 3 describes in greater detail the characteristics of each user group and the facilities associated with each.

Character, the physical context in which the street resides, is the third influence to consider in good Complete Street design. Character influences the form and function of the roadway and its associated streetscape. In Louisville Metro, character is defined by Cornerstone 2020 and the designation of Form Districts — 11 distinct patterns of development that are applied county-wide. For the purpose of this Manual, these 11 Form Districts have been grouped into four general categories or Character Classes: Downtown, Traditional, Suburban, and Rural (see figure below).

A comprehensive design approach is necessary when developing a functional and aesthetically pleasing

A FULLY DEVELOPED DOWNTOWN CHARACTER CLASS ROADSIDE

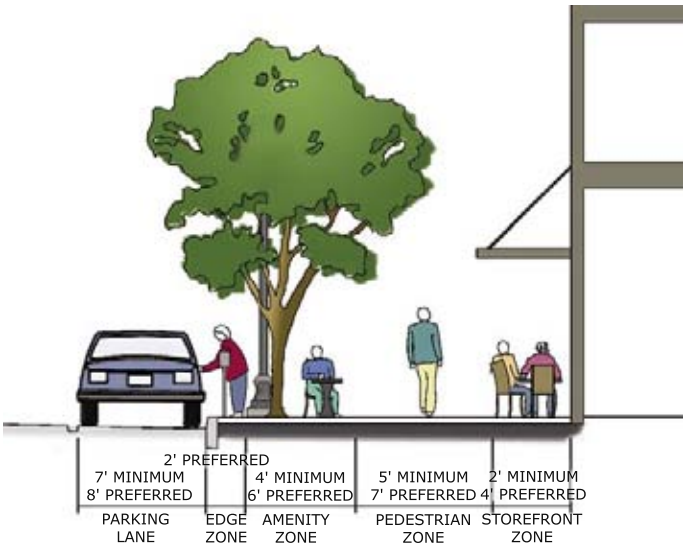
roadway and roadside. To design a complete street, there must be an understanding of the three relational elements and how they influence a transportation corridor. For instance, the inner-relationship between engineering judgment and user needs is most prevalent when considering on-road facility design guidelines. Off-road facility guidelines, however, tend to be based more on user needs and roadway character. Engineering judgment, user needs, and character overlap and intersect in varying ways with on-road facilities (such as a bike lane), off-road facilities in the right-of-way (such as a sidewalk), and the nature of the roadway (urban or rural cross-sections).

Character Classes (Form District Groupings)			
Downtown	**Traditional**	**Suburban**	**Rural**
• Downtown Form District	• Traditional Neighborhood • Traditional Marketplace Corridor • Traditional Workplace • Village Center • Town Center	• Neighborhood • Suburban Marketplace Corridor • Suburban Workplace • Regional Marketplace Center • Village Outlying • Campus	• Village Outlying

Roadside Components by Character Class

In addition to the relational elements, the roadside can be described by the activities that fall within it. These activities can be broken into four basic zones: the Edge Zone, the Amenity Zone, the Pedestrian Zone, and the Storefront Zone (see example on the right).

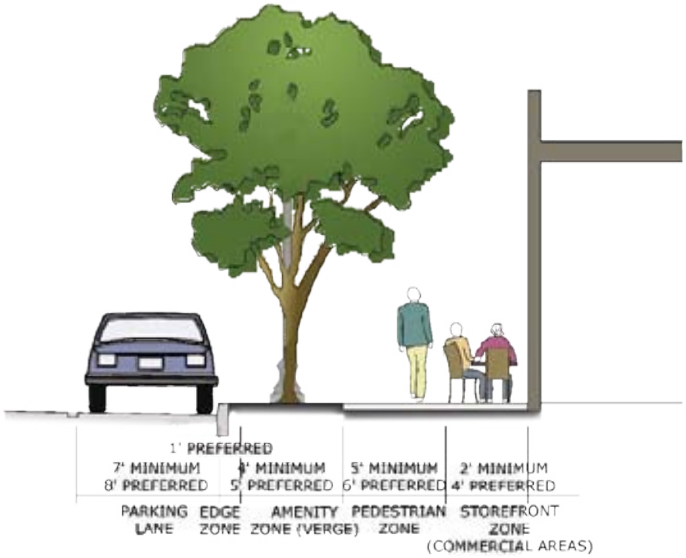
The Edge Zone is located adjacent to the road pavement and includes the curb but not the verge (the landscape area that separates the sidewalk from the street). The Amenity Zone is located between the Edge Zone and the Pedestrian Zone. It includes the verge, if applicable, and the portion of the sidewalk used for street furnishings. The Pedestrian Zone is located between the Amenity Zone and Storefront Zone and allows for the unobstructed passage of pedestrians with a preferred width of seven feet and a minimum width of five feet. The Storefront Zone, located between the Pedestrian Zone and the building façade, has a preferred width of four feet and a minimum width of two feet to accommodate window viewing, outdoor displays, and permits door swing movements. It also allows for restaurant seating or other uses with outdoor spaces.



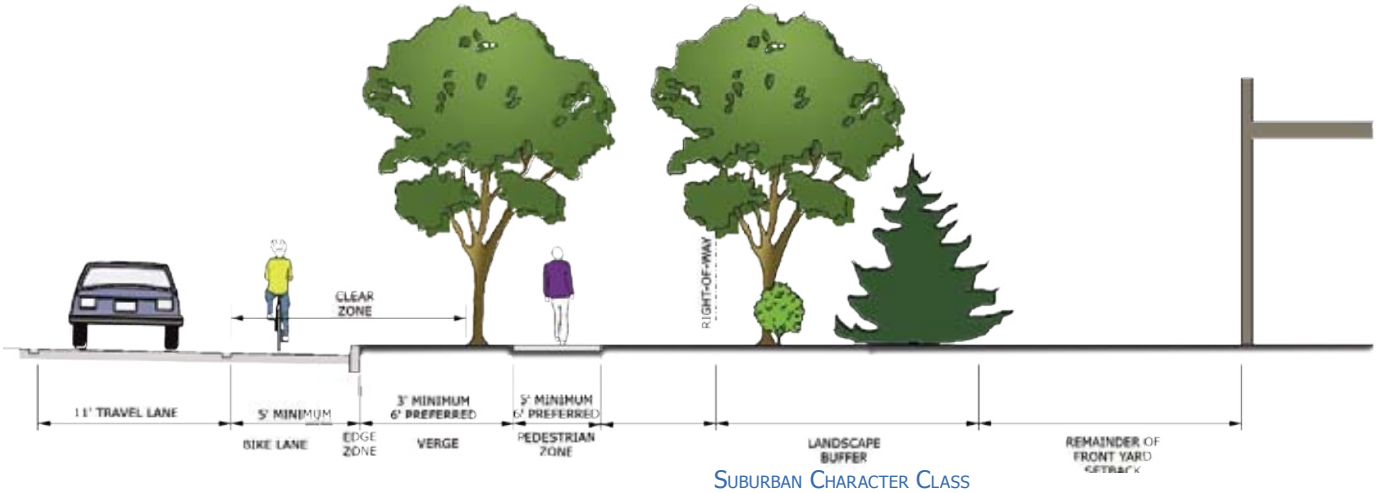
Downtown Character Class

The Downtown Character Class roadside has all four activity zones clearly defined. The Edge Zone contains parking meters where there is on-street parking and may include a concrete strip for pedestrians exiting vehicles. The Amenity Zone contains many of the streetscape elements that help define the downtown including street trees, seating areas, and light poles. This is also the appropriate area to locate trash receptacles, mail boxes, newspaper corrals, bicycle racks, and other furnishings. The Pedestrian Zone is the travel area of the sidewalk.

The nature of the Traditional Character Class roadside utilizes a smaller Edge Zone primarily for curbs. The Amenity Zone accommodates tree planting, lighting, and overhead utilities. The Amenity Zone may be paved, but typically becomes a verge as the corridor extends beyond the downtown. The Pedestrian Zone may include a slightly narrower sidewalk than in the downtown, but shall maintain a 5 foot width clear of obstructions. Non-residential areas within the Traditional roadside may continue to have a paved Storefront Zone; in residential areas this becomes a vegetated front yard.



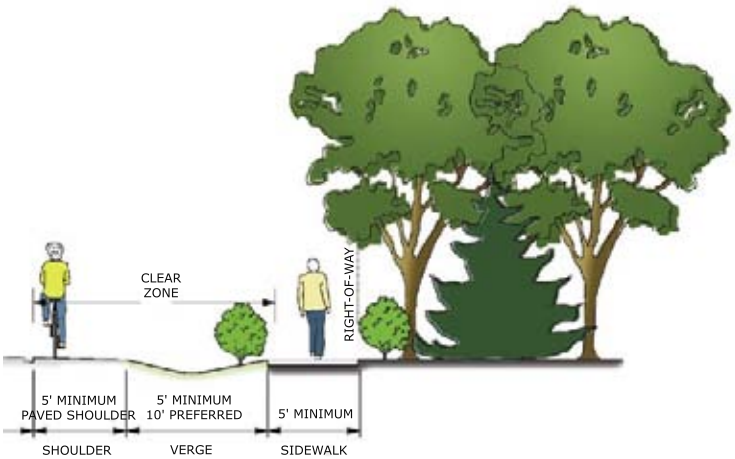
Traditional Character Class



Suburban Character Class

The Suburban Character Class roadside Edge Zone is primarily a curbed area and may include mail boxes. The Amenity Zone is a verge that may contain occasional street furnishings, including benches and TARC shelters. The Pedestrian Zone contains a five foot sidewalk. The Storefront Zone no longer applies because setbacks from the street dictate a greater separation between the street and the buildings.

The Rural Character Class roadside has an Edge Zone that contains a shoulder rather than a curb and may include mailboxes. The Amenity Zone is a verge. On occasion, there may be a Pedestrian Zone with a sidewalk or a multi-use path, though these facilities may or may not be located in conjunction with the street.



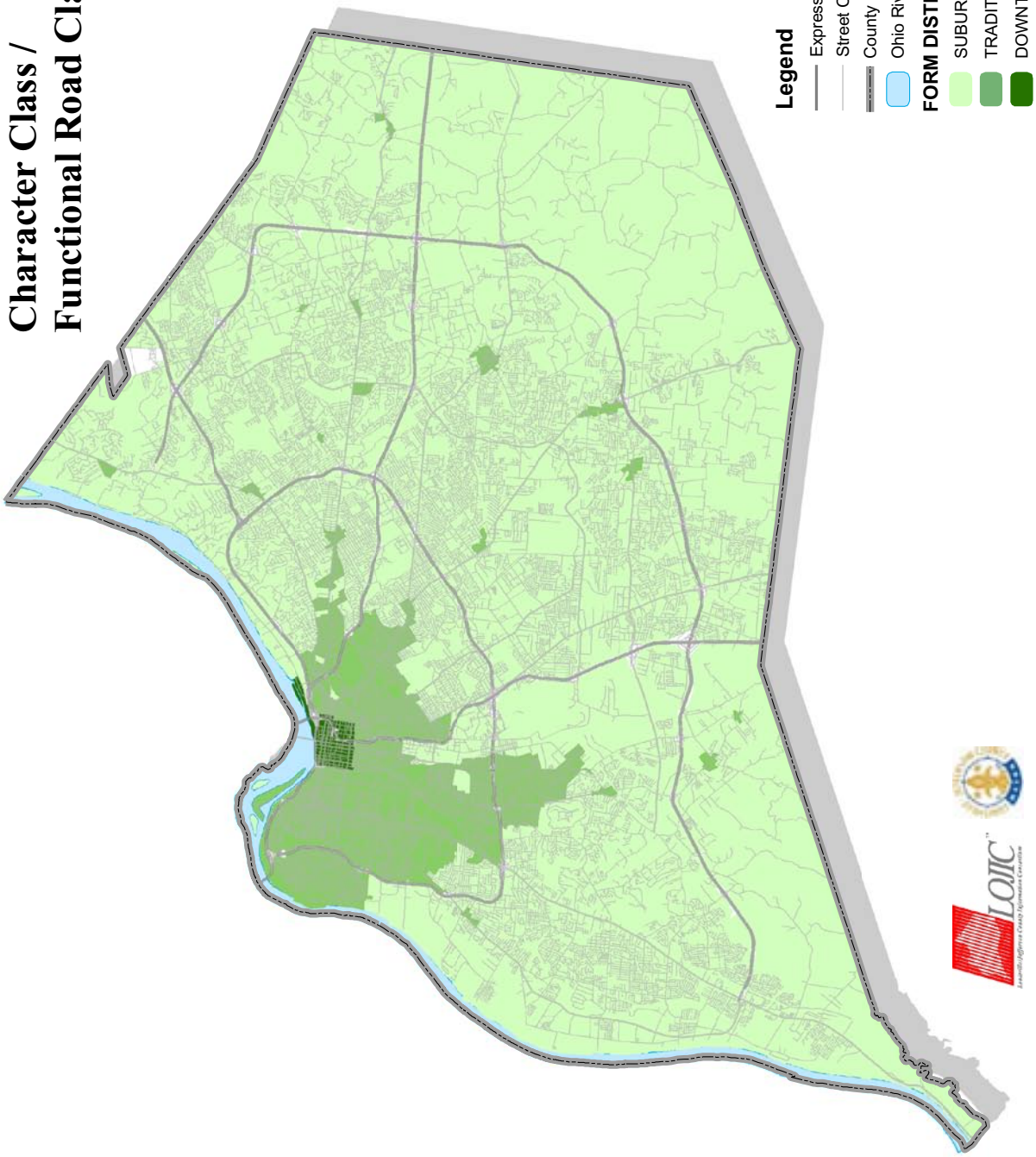
Rural Character Class

The Character Classes and Functional Roadway Classes for Louisville Metro are illustrated by the map on page 9. The Rural Character Class can not be mapped, however, because there are no areas "officially" designated as such nor have there been any Form Districts classified as rural.

Rural character areas have been partially identified in the context of various neighborhood, corridor, and small area plans such as the Wolf Pen Branch, Eastwood, Fairdale, and Tyler Rural Settlement District Neighborhood Plans; The Master Plan of Jefferson Memorial Forest; and Site Development Plan for Riverside, The Farnsley-Moreman Landing. In order to plan for appropriate facilities such as multi-use paths, there must be a comprehensive effort undertaken to identify areas within Louisville Metro that are intended to be part of a Rural Character Class.

Example of Rural Character Class

Character Class / Functional Road Class Map



NOT TO SCALE

Functional System	Services Provided
Arterial	Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control.
Collector	Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials.
Local	Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement.

THOROUGHFARE TYPOLOGY

Streets and highways are grouped using a classification system established by the Federal Highway Administration based on the function of the road. There are three highway functional classifications: arterial, collector, and local. There is a basic relationship between traffic mobility and land access that differentiates the functional roadway classes (see figure above).

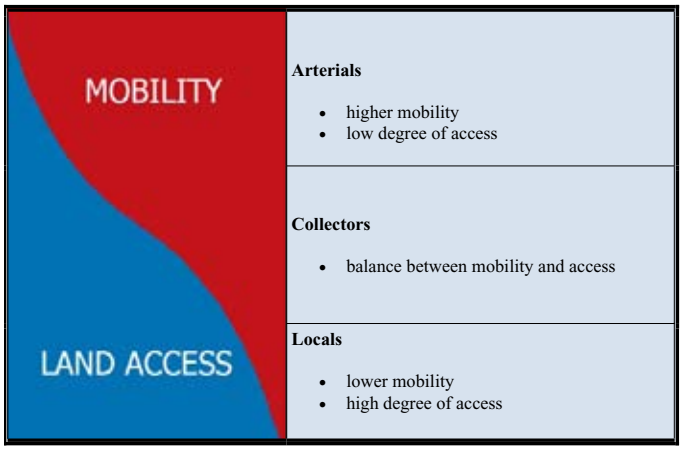
There is an established relationship between the functional classification of a roadway and the design process. The AASHTO Green Book, a nationally recognized resource for roadway design, relates functional class to a range of design criteria based on anticipated volumes and the composition of traffic associated with a given roadway class. These criteria include design speed, horizontal/vertical alignment, and basic roadway cross section information such as lane width, shoulder width, and type and width of the median area (*Flexibility in Highway Design*, FHWA).

The roadway classifications within Jefferson County are broken into additional sub-classes such as major arterials, minor arterials, primary collectors, secondary collectors, local roads, alleys and lanes and specially-classified roadways.

The guidelines contained in this manual have been developed based on a relationship between the Functional Class of the roadway and the Character Class of the roadway.

The design criteria in the following chapters will guide the appropriate facility to match user needs for a specific Functional Class while responding the Character Class for that area.

This context is also added to the roadway's cross-section which may be urban or rural. Urban sections are typically curbed with an underground stormwater drainage system. Rural sections are typically without a curb while having an above-ground roadside stormwater drainage system. These conditions all add to the character of the street and streetscape.



SOURCE: SAFETY EFFECTIVENESS OF HIGHWAY DESIGN FEATURES, VOLUME I, ACCESS CONTROL, FHWA, 1992.

Chapter 3: Users and Facilities

Introduction

In order to plan, design, and implement a thoroughfare system that helps promote choice, ensures equitable access to transportation, and reduces societal reliance on a single mode of transportation, we must first understand the user groups and the types of facilities required.

Pedestrians

Kentucky statutes define a pedestrian as "any person afoot or in a wheelchair." [KRS 189.010(8)]. Therefore, any individual at some time during a trip is defined as a pedestrian, whether traveling to their car, bus stop, bicycle, or to a final destination.

Pedestrians as a group represent a broad range of abilities according to AASHTO's *Guide for Planning, Design and Operation of Pedestrian Facilities* (July 2004). However, it distinguishes abilities of individuals based entirely on age. To appropriately plan pedestrian facilities, one must consider that an individual in any age group can have special needs or demands outside the able bodied pedestrian (see figure below).

Planning for pedestrian facilities requires an understanding of the trip itself. Pedestrian trips can be classified according to the context of the trip. The Traffic Institute at Northwestern University indexes trips into three categories: primary, secondary, and terminal trips.

Age	Characteristics
0-4	Learning to walk Restricted peripheral vision, depth perception
5-8	Increasing independence
9-13	Poor judgment Sense of invulnerability
14-18	Improved awareness of traffic environment Poor judgment
19-40	Active, fully aware of traffic environment
41-65	Slowing of reflexes
65+	Mobility restricted Vision and Hearing Loss High fatality rate

Primary trips are those that have a specific intended destination. Activity centers such as shopping districts or office parks create the highest levels of pedestrian activity because they are the destination for many primary trips.

Secondary trips are additional/unplanned trips or deviations from the primary trips. An example of a secondary pedestrian trip might be stopping at the drug store on the way to work.

A terminal trip, the final classification, represents the pedestrian portion of a trip primarily made through the use of another mode of transportation. An example of a terminal trip would be walking to the bus stop. Terminal trips would likely have the greatest impact during peak periods such as the morning or evening rush, lunch hours, or immediately before or after a sporting event.

Facilities

There are a few basic types of pedestrian facilities that act as linkages in a thoroughfare system: sidewalks, paths, shared use paths (multi-use trail), and shoulders. Sidewalks are primarily for pedestrians and are a paved portion of the public frontage. Paths are designed for pedestrians but may attract multiple user types. Paths provide a linkage through a park, greenspace, or rural area and typically match the landscape of the open space. A shared use path is physically separated from motorized vehicular traffic by an open space or barrier and can be located within the highway right-of-way or within an independent right-of-way. Shared use paths attract multiple users such as pedestrians, skaters, joggers, and bicyclists. Shoulders are a paved portion of the roadway to the right of the traveled way and are designed to serve bicyclists, pedestrians, and others.

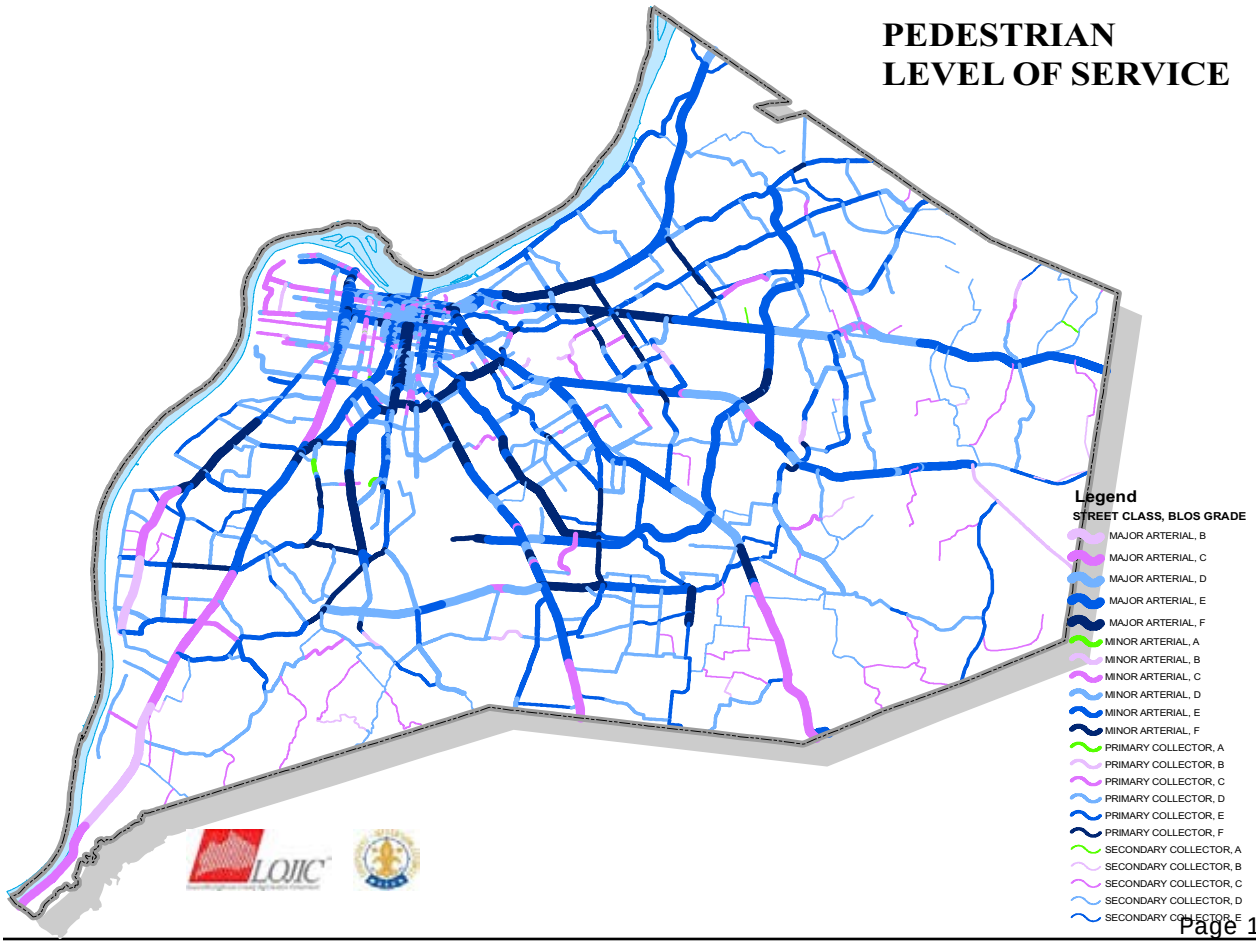
All facilities act as linkages for individuals capable of varying degrees of mobility and should utilize accessible, barrier-free routes that integrate universally accessible amenities. Facilities that are accessible to people with disabilities are generally safer and more user-friendly for all pedestrians.

POLICY

A thoroughfare system that creates "Complete Streets" will require facilities that promote safe pedestrian trips for individuals of all ages and abilities. Future public improvements and private developments shall accommodate for universally accessible pedestrian linkages. Government agencies and the private sector will partner to provide pedestrian linkages between densely populated areas and public institutions, activity centers, and transit stops. Integrating universally accessible pedestrian linkages into the transportation infrastructure will be as equally important as providing for motorized transportation.

In July 2002, the Kentucky Transportation Cabinet established a bicycle and pedestrian policy that incorporates pedestrian facilities into road projects. It states, "The Kentucky Transportation Cabinet (KYTC) will consider the incorporation of pedestrian facilities on all new or reconstructed state-maintained roadways in existing and planned urban and suburban areas."

Louisville Metro 'sidewalk in-lieu of' funds shall be used to continue sidewalks from the edge of the existing infrastructure inside of that council district. The goal is to connect the existing sidewalk system together and not leave voids between sections of the pedestrian infrastructure. Priority should be given to connecting schools to neighborhoods, neighborhood commercial to residential areas, and transit facilities to all adjacent land uses. Pedestrian facilities should be adjacent to roadways, but separated from the curb whenever possible using the Amenity Zone with landscaping, a bicycle lane, or on-street parking. A clear vision area should be maintained so pedestrians can see each other and vehicles in the public realm while keeping vegetation from becoming an obstacle or encumbrance.



Bicycles

Bicyclists

Just as there are different skills, ages and types of pedestrians, so are there different types of bicyclists. *Selecting Roadway Design Treatments to Accommodate Bicycles* (FHWA-RD-92-073) outlines the following user categories to assist in the design of facilities: Advanced (A), Basic (B), and Children (C) bicyclists.

Advanced riders include commuters and high-mile enthusiasts. They are comfortable in traffic, have prolific riding skills and know the traffic/safety rules. Basic riders have low-mileage rides that are usually destination based and mostly ride for recreation. They have occasional rides and some knowledge of traffic/safety rules. Children riders are teens and younger. They have occasional short-distance rides and little relative experience with traffic/safety rules. The FHWA recommends that bicycle facilities be designed based on criteria of the Advanced bicyclist or the Basic/Children bicyclists. The average daily traffic (ADT) and the design speed of the roadway determines the best facility for the users. The FHWA guidelines tend to recommend wider outside lanes and shared facilities for Advanced cyclists and the use of shoulders and bike lanes for Basic/Children cyclists as the traffic speed increases. Though it is helpful to consider different kinds of users, not all facilities suit all kinds of bicyclists. For instance, some riders may be more comfortable on the roadway than others. Alternates for facilities may be used for different bicyclists as their skill level and comfort permit.

A commuter is an Advance Bicyclist

A Basic Bicyclist and Child Bicyclist
Source: www.kids-safety-klub.com

Facilities

Bicycle facilities vary throughout the built environment. Variations depend on the engineering judgment of on-road/off-road facilities, available room on existing roadways, and the character class of the area. The facilities include: shoulders, shared lanes, wide curb lanes, bicycle lanes, and shared use paths. Shoulders (SH) are a paved portion of the roadway to the right of

the traveled way designed to serve bicyclists, pedestrians, and others as road design allows. A shared lane (SL) is a "standard width" travel lane that both bicycles and motor vehicles share. A wide curb lane (WC) is an outside travel lane with a width of at least 14 feet to accommodate both bicyclists and motorized vehicles for shared use and is the same term as "wide outside lane." A bicycle lane (BL) is a portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicycles and other non-motorized vehicles. Bike facility on-road accommodation may occur by: reducing the number of motor vehicle lanes; reducing the lane widths; changing the on-street parking; and/or sharing the roadway in the form of shared lanes (SL), wide curb lanes (WC), and shoulders (SH).

A shared use path (SUP) is a path physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. SUPs are the same as multi-use trails and may also be used by pedestrians, skaters, wheel chair users, joggers, and other non-motorized users. Additionally, mass transit can be considered a bicycle facility because all TARC busses have bike racks to allow users to move along all major corridors that connect to one another. It serves as an option for less-experienced users to travel to destinations or facilities where they are more comfortable while traversing busier parts of the city.

The Suitability of Louisville Metro Road for Bicycling and Walking studied the metro area's arterial and collector roadways for bicycle level of service. The findings of the roadways were mapped using LOJIC and shows current suitability, while suggesting planning and possible solutions to existing roadways. The possible solutions include narrowing lanes, reducing the number of lanes, and reconsidering on-street parking if there is not a sufficient need for on-street parking.

Shoulder used as a bike facility

Bike Lane on Spring Street

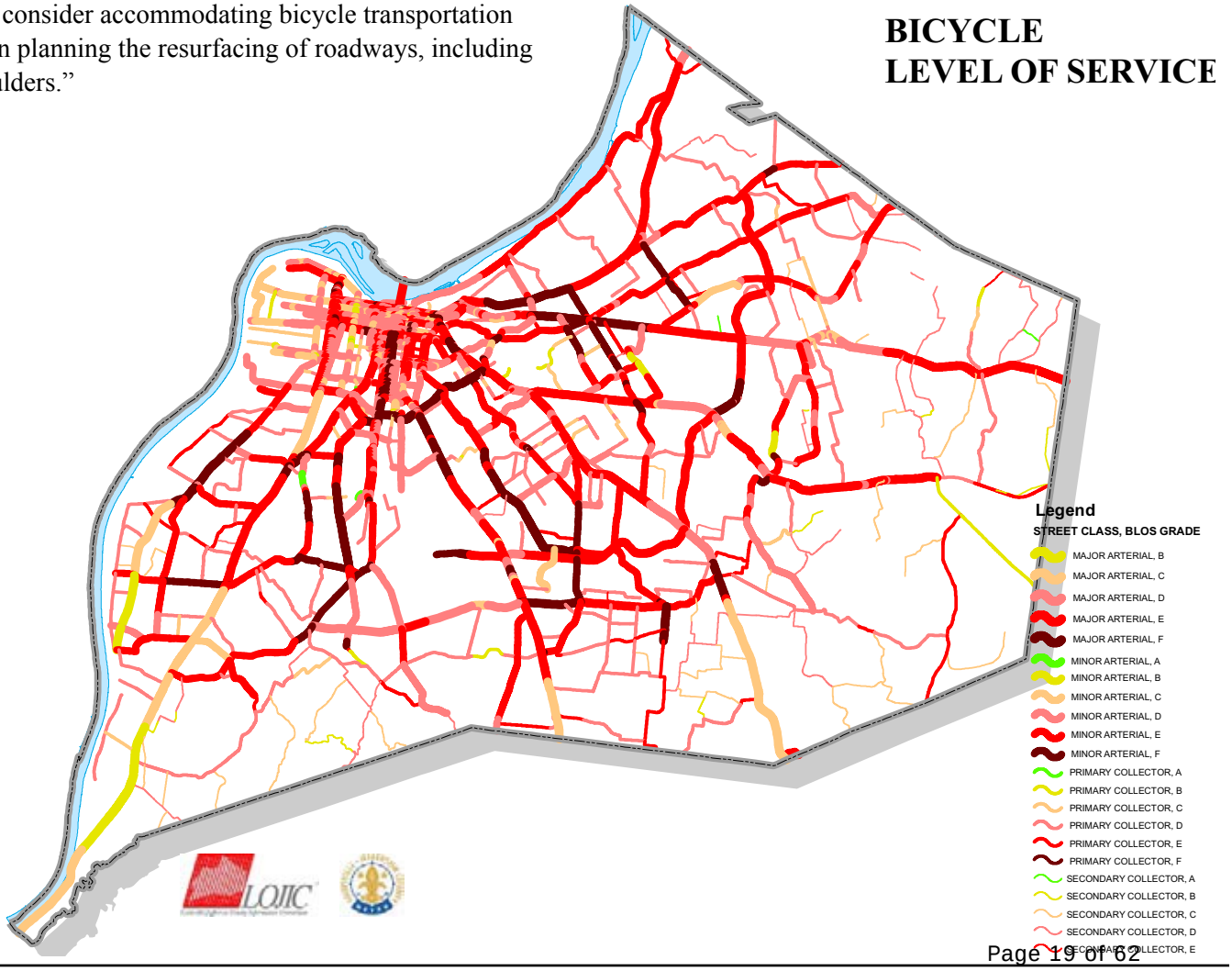
Butchertown Greenway is a Shared Use Path

POLICY

Bicycle facilities shall be a part of roadway design and construction along bikeway corridors (refer to Louisville Metro Bike Map). These facilities may include: shoulders shared lanes, wide curb lanes, bicycle lanes, and shared use paths. Bicycle lanes designate a portion of the roadway with preferential use for bicyclists. Bicycles are permitted on all streets (except as prohibited by law such as riding on freeways) as a vehicle per 601 KAR 14:020.Section 9 and KRS 189.010 (19) (a).

The Kentucky Transportation Cabinet created a bicycle and pedestrian policy in July 2002 that incorporates bicycle facilities into road projects. It states, "The Kentucky Transportation Cabinet (KYTC) will consider the accommodation of bicycles on all new or reconstructed state-maintained roadways. KYTC will also consider accommodating bicycle transportation when planning the resurfacing of roadways, including shoulders."

BIKE LANE (BL) ON JACKSON STREET



Transit

Public transit provides another transportation alternative for Louisville Metro residents. The American Public Transportation Association defines public transportation as a bus, rail, or other conveyance, either publicly or privately owned, which provides to the public general or special service on a regular and continuing basis. Public Transportation is also known as "mass transportation," "mass transit," and "transit." Transit and its facilities play an important role in Louisville Metro and should be designed to accommodate all people including children, the elderly, and persons with disabilities.

TARC Bus Stop with shelter

Transit Users

Transit riders can be classified as belonging to one of two groups: those who use transit by choice and those who are captive users because they have no other viable option. Riders who elect to use transit are likely do so because of time, cost, convenience, comfort, or environmental concerns. Captive transit riders might be bound to public transportation because of age, disability, income or family circumstances (Beimborn). In Jefferson County, 60% of transit riders have no other viable transportation alternative (Site GoBility by TARC).

TARC Stop with Bike Racks allow for transitions between transportation

TARC near-side transit stop

Facilities

Transit facilities consist of boarding areas, bus pull-off areas, high occupancy vehicle lanes, transit stops, park and ride lots, and transit routes.

Transit routes are a type of transit service that operates as a fixed route along a fixed alignment or path with scheduled times for arrival and departure at terminal points and key intermediate locations. Transit Authority of River City (TARC) provides transit service across Louisville Metro (see route map on page 20).

A transit stop is a location where passengers board and land. Transit stops can serve one or more routes and include various levels of amenities depending on the level of actual or anticipated ridership.

Boarding areas are transit stops that provide a small amount of seating and a covered waiting area to protect from the elements. A shelter or awning with benches is the most common form of boarding area, but more creative designs are allowed locally with approvals by the Planning Director and Executive Director of TARC.

A bus pull-off area is a designated portion of the street where buses can stop to drop off and pick up passengers.

High occupancy vehicle lanes are designated lanes of a roadway that have been reserved for carpools, van pools, and busses.

A park and ride lot is a service that offers transit riders a place to park their car, and then transfer to a bus to complete their journey. Park-n-Tarc is the name given to local park and ride facilities.

Mass transit can also be considered a bicycle facility. All TARC buses are equipped with bike racks that allow cyclists to board. This provides an option for less experienced riders to travel to destinations or facilities by bus rather than traversing busier parts of the city on their bikes, or as an option for traversing longer distances.

Policy

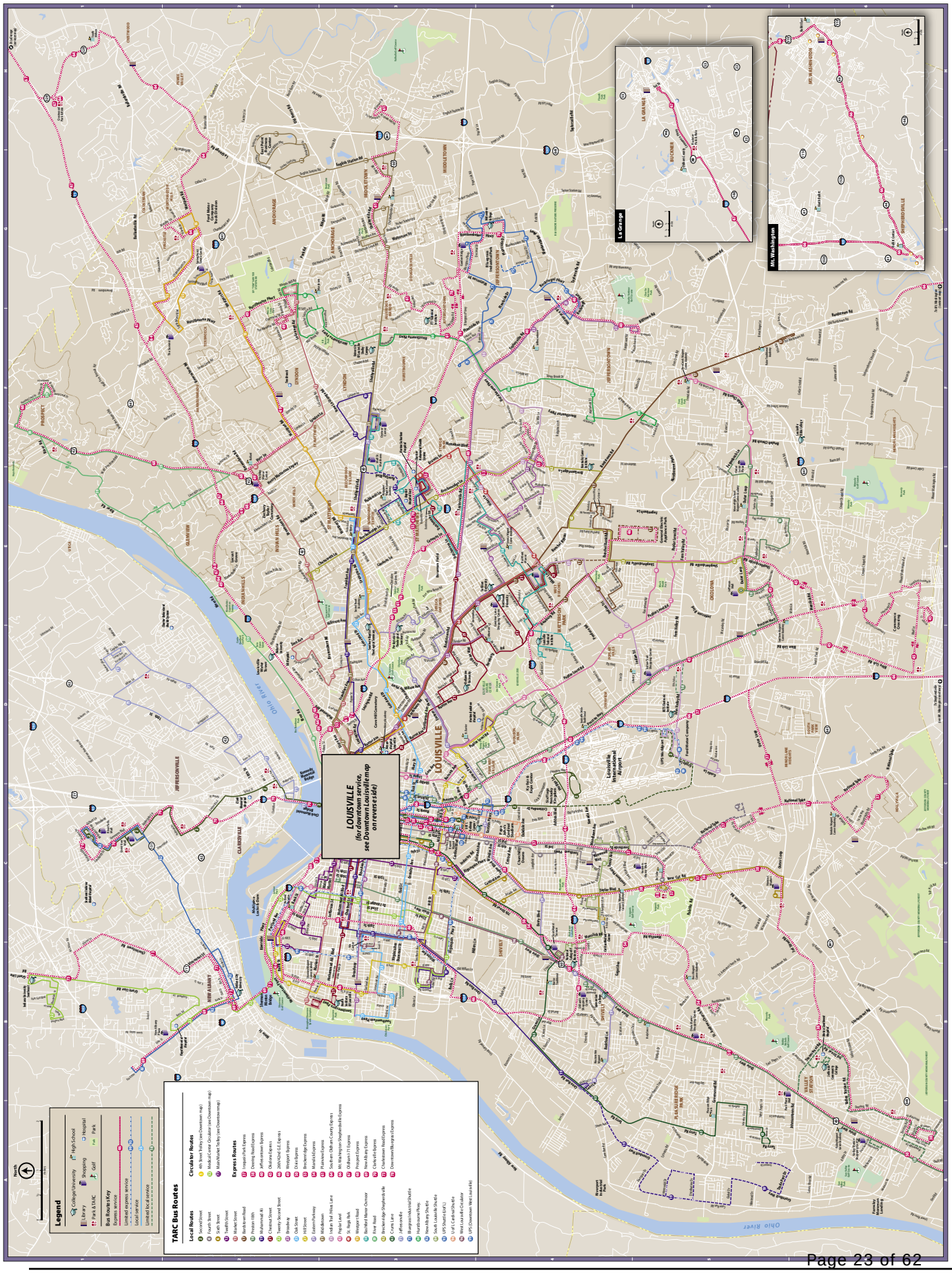
Transit facilities will be a part of all future roadway improvements and private developments. Transit facilities should accommodate people of all abilities including children, the elderly, and persons with disabilities.

Bus Stops should connect pedestrians from the street to the adjacent land uses

Bus Shelters can be designed with character

BUS PULL-OFF
SOURCE: WWW.PEDBIKEIMAGES.ORG
DAN BURDEN

DEDICATED BUS LANE
SOURCE: HTTP://MEMBERS.OPTUSHOME.COM.AU/CLANMCLAREN/RIDE _ TO _ WORK.HTM
ALLISTER MCLAREN


TARC Bus Routes
Local Routes
Circuit Routes
Express Routes
Legend
Bus Routes Key
LOUISVILLE
(for downtown service, see Downtown Louisville map on reverse side)
La Grange
Mt. Washington
Ohio River
North

Motorists

Motorists can generally be divided into three groups which would include personal vehicles, commercial drivers, and busses. Personal vehicles include a wide range of vehicle types from small compact cars to large trucks and sport utility vehicles. [Commercial drivers include semi-trucks as well as delivery vans and box trucks. Bus users include public transportation, schools, and private travel companies.] The volume of each group should be considered in the geometric design of the roadway including the lanes provided and on-road facilities such as parallel parking and bike lanes.

Facilities

Motorist facilities consist of the roadway lanes, and on-road facilities such as on-street parking. The lane widths and configuration are designed by analyzing several factors including the context of the surrounding environment, available right-of-way width, topographic constraints, volume of different users, and the mix of users on the road.

Cornerstone 2020 and the Land Development Code have designated the roadway classification for roadways in Jefferson County. Core Graphic 10, Roadway Classification and Projected Corridors, and the LDC divide roadways into six classifications. These are: major arterial, minor arterial, primary collector, secondary collector, local, and alley/lane. Each roadway classification serves a specific function.

Major and minor arterials carry the highest volume of traffic and have the highest rate of speed. They connect major activity centers and neighborhoods. Primary and secondary collectors serve as the collection and distribution system between local roadways and arterial roadways. Collector roadways provide circulation between neighborhoods and other high traffic uses such as employment centers. Collector roadways have moderate speed levels. Local roads, alleys, and lanes provide direct access for individual property owners. They typically have low traffic volumes and low speeds.

Vehicles queued in a center turn lane

Roadways can be further divided by looking at the adjoining form district including rural, suburban, traditional and downtown character districts. Each roadway classification and its surrounding context must be considered in the design of new roadways and when existing roadways are repaired or expanded.

Chapter 4: Facility Design

Introduction

The facility design criteria represented on the following pages is intended as a guideline in the planning and design of new and/or reconstructed streets and streetscape design elements. These guidelines are representative of current best management practices for Complete Streets design and bicycle, pedestrian, and motor vehicle facilities. These guidelines should be considered in conjunction with other national, state, and local guidelines including the *Americans with Disabilities Act Accessibility Guidelines* (ADAAG), the *Manual of Uniform Traffic Control Devices* (MUTCD), the American Association of State Highway Transportation Officials (AASHTO) *Design and Safety of Pedestrian Facilities* and *Design and Safety of Bicycle Facilities*.

Facility Selection and Character Class

The appropriate Complete Street facilities for any given roadway corridor in the Louisville Metro area are dependent on two factors — area character, as established by the Form District(s) and functional classification of the roadway. Specific design characteristics as well as facilities unique to each user group can be associated with any given Thoroughfare Type identified in Chapter 2, "Design Framework."

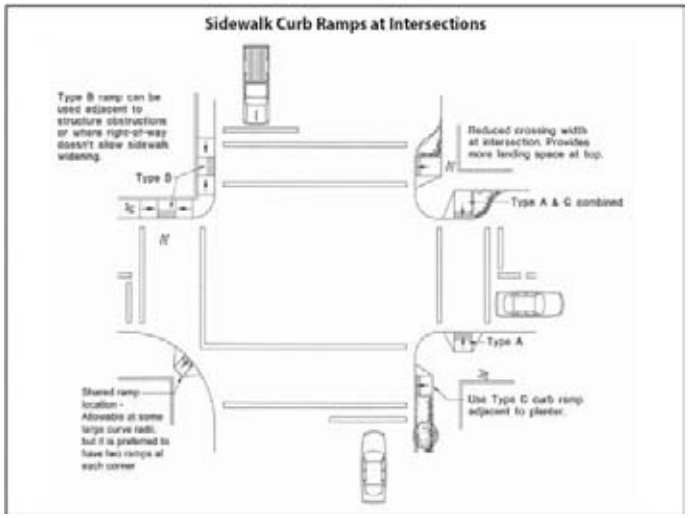
To use this Manual, first determine the appropriate facilities for the thoroughfare type being designed based on the Functional Class/Character Class Matrix found on page 24. Typical cross-sections for each Functional Class/Character Class pair have been developed to show the spatial relationship between the Complete Street facilities associated with each Thoroughfare Type and their preferred dimensions (see Appendix A).

Pedestrian Design Criteria

The *Americans with Disabilities Act Accessibility Guidelines* states:

"Title II of the Americans with Disabilities Act requires public entities that build sidewalks and trails to provide program access to existing facilities and altered facilities to be readily accessible to individuals with disabilities. Title III of the ADA requires places of public accommodation to remove barriers to access when it is readily achievable to do so and to meet the requirements for new construction and alteration in the *ADA Standards for Accessible Design* or UFAS [*Uniform Federal Accessibility Standards*] and employ good design principles to ensure that facilities are accessible to and usable by people with disabilities."

Accessible curb ramps shall be provided at all intersections having curbs or other barriers to entry from a street-level pedestrian walkway or whenever a new street, road, or highway is constructed or altered. Accessible curb ramps shall be provided at all newly constructed or altered pedestrian walkways where they intersect a street, road, or highway. Every effort should be made to use directional curb ramps and ADA detectable warnings shall be used at the end of sidewalks to crossings or road improvements. The warnings should be located at the very edge of the transition from the curb onto the roadway.



Accessible curb design options, Source: Pedestrian & Streetscape Guide, GDOT.

Thoroughfare Typology

CHARACTER CLASS (FORM DISTRICTS)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)

FUNCTIONAL CLASS (ROAD CLASSIFICATIONS)

See Glossary and Appendix A for an explanation of abbreviations

Major Arterial (A)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)
Auto AR-1 to AR-3 **Cyclist** SH, SUP, SL, Transit **Pedestrian** SH, SUP, Transit **Transit** Stops	**Auto** AS-1 to AS-12 **Cyclist** SH,BL,SUP, Transit, SL **Pedestrian** Sidewalk, SUP, Transit **Transit** Stops	**Auto** AT-1 to AT-09 **Cyclist** BL, Transit, SL **Pedestrian** Sidewalk, Transit **Transit** Designated Pull-offs Shelters	**Auto** AD-1 to AD-9 **Cyclist** BL, Transit, SL **Pedestrian** Sidewalk, Transit **Transit** Designated Pull-offs Shelters

Minor Arterial (A)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)
Auto AR-1 to AR-3 **Cyclist** SH, SUP, SL, Transit **Pedestrian** SH, SUP, Transit **Transit** Stops	**Auto** AS-1 to AS-12 **Cyclist** SH, BL, WC, SL SUP, Transit **Pedestrian** Sidewalk, SUP, Transit **Transit** Stops	**Auto** AT-1 to AT-09. **Cyclist** BL, SUP, SL, Transit **Pedestrian** Sidewalk, SUP, Transit **Transit** Designated Pull-offs Shelters	**Auto** AD-1 to AD-9 **Cyclist** BL, Transit, SL **Pedestrian** Sidewalk, Transit **Transit** Designated Pull-offs Shelters

Collector (C)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)
Auto CR-1 to CR-4 **Cyclist** SH, SUP,SL, Transit **Pedestrian** SH, SUP, Transit **Transit** Stops	**Auto** CS-1 to CS-12 **Cyclist** SH, BL, SL, WC, SUP, Transit **Pedestrian** Sidewalk, SUP, Transit **Transit** Stops	**Auto** CT-1 to CT-12 **Cyclist** BL, WC, SL, SUP, Transit **Pedestrian** Sidewalk, SUP, Transit **Transit** Stops	**Auto** CD-1 to CD-9 **Cyclist** SL, WC, Transit **Pedestrian** Sidewalk, Transit **Transit** Stops

Local (L)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)
Auto LR-1 to LR-2 **Cyclist** SH, SL, SUP, Transit **Pedestrian** SH, SUP, Transit **Transit** Stops	**Auto** LS-1 to LS-2 **Cyclist** SH, SL, SUP, Transit **Pedestrian** Sidewalk **Transit** Stops	**Auto** LT-1 to LT-9 **Cyclist** BL, WC,SL, SUP, Transit **Pedestrian** Sidewalk, SUP **Transit** Stops	**Auto** LD-1 to LD-9 **Cyclist** BL, WC, SL **Pedestrian** Sidewalk **Transit** Stops

Alley/Lane (AL)

Rural (R)	Suburban (S)	Traditional (T)	Downtown (D)
Auto ALS-1 **Cyclist** SL **Pedestrian** SL	**Auto** ALS-1 **Cyclist** SL **Pedestrian** SL	**Auto** ALT-1 to ALT-3 **Cyclist** SL **Pedestrian** SL	**Auto** ALD-1 to ALD-4 **Cyclist** SL, WC **Pedestrian** SL

IMAGE ABOVE FROM THE TRANSECT BY DUANY PLATER-ZYBERK, HTTP://WWW.DPZ.COM/PUBLISHED.HTM

Accessible pedestrian signals (APS) shall be considered based on the criteria specified in the Manual of Uniform Traffic Control Devices (MUTCD). When an accessible pedestrian signal is used, it shall include a push button locator tone, a raised arrow oriented in the direction of travel, a speech WALK message, a vibrotactile WALK indication to warn pedestrians before entering the roadway. The push buttons should be a maximum of five feet from the ramp. The locator tone should be variable but five dB louder than the ambient street noise level.

Accessible Pedestrian Signal

Sidewalk widths and crossings

Sidewalks should be continuous and installed with a minimum clear width of five feet (7 ft. desirable) in the pedestrian zone. The width may be reduced to four feet for a length of two feet, if there is insufficient space due to street elements as long as the confining elements are separated by five feet. See the appropriate cross sections for the size specified with a particular Functional and Character Class. Crosswalks shall be used to improve the safety of a pedestrian crossing, especially on multi-lane roads with average daily traffic (ADT) above 10,000. The walking speed used for crossings and signalization shall be three and a half feet per second (following the Draft Guidelines for Accessible Public Rights of Way) with the walk interval being at least seven seconds. Shorter or longer times may be considered when a study and justification are completed. Countdown signals shall be used at high-pedestrian traffic intersections.

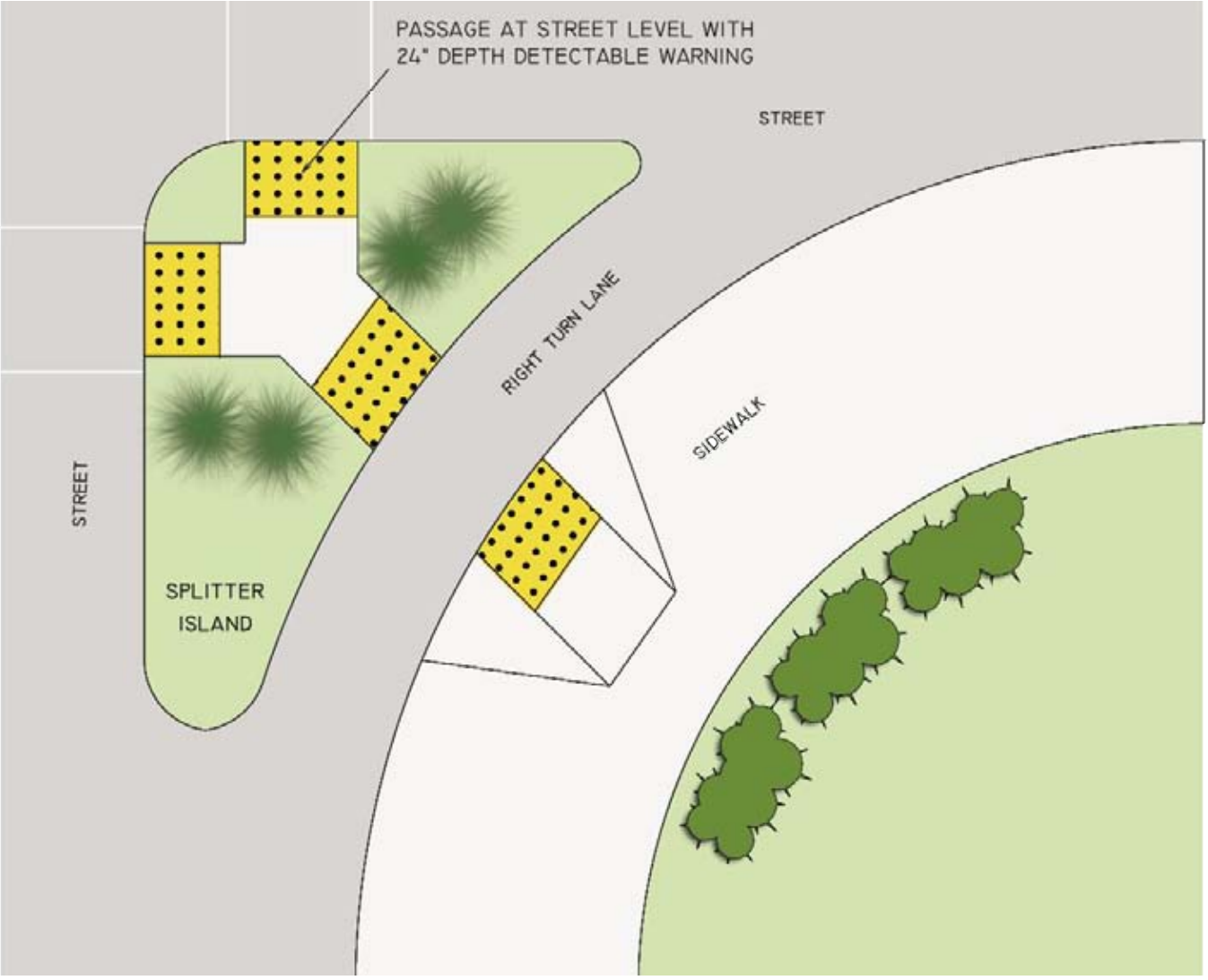
Pedestrian refuges may be used at multi-lane intersections or turning lane islands where crossing may take longer than one signal cycle. Pedestrian signals should be coordinated with refuge islands and may need additional push buttons. The refuge islands shall meet ADA Accessibility Guidelines including regulations on slopes, detectable warnings, and crossing from the refuge to the pavement at grade. Railroad crossings also shall have detectable warnings, cross at 90 degrees, and meet slope guidelines at the appropriate pedestrian crossing points as shown in the figure. ADAAG and AASHTO guides provide designers with many tables of information for more specific design of sidewalks including changes in level, grates and gaps, obstacles, and protruding objects. This information shall be followed at all times.

Crosswalk with ADA tactile warnings on ramps

Slopes

Maximum grades on sidewalks should be five percent where possible. When topography does not allow, the AASHTO Green Book recommends that the running grade of sidewalks be consistent with the running grade of adjacent roadways. ADAAG permits the running grade of the sidewalk to be consistent with the grade of the adjacent roadways but recommends that the minimum feasible slope be used. ADAAG specifies that sidewalks should lie in a continuous plane with a minimum of surface warping. Cross slopes should not exceed 1:50 or two percent.

Median refuge island, Source: http://www.pedbikeimages.org/, ITE Pedestrian Bicycle Council

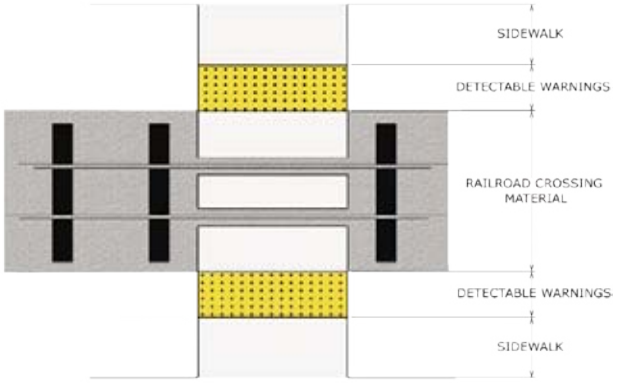


A Splitter Island that acts as a Refuge Island for pedestrians

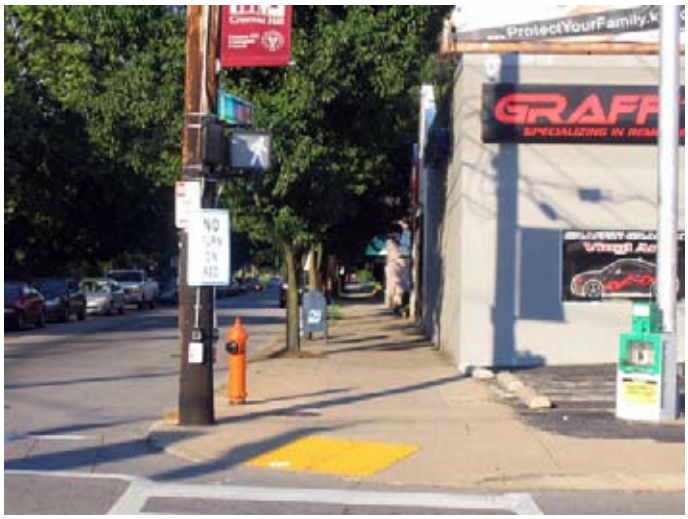
Surfaces

The type of walking surface often determines how difficult an area is to negotiate. ADAAG defines accessible surface characteristics as needing to be firm, stable, and slip-resistant. AASHTO requires sidewalks to have all-weather surfacing. The sidewalk material, such as concrete, should pass through the entrances as continuous material and contrast with the surrounding material for directing visually impaired. The pedestrian sidewalk material shall be strengthened to withstand use by vehicular traffic by increasing thickness and adding reinforcement. Sidewalks should be used along private access easements in Traditional and Suburban classes. Rural class areas may use wider shoulders instead of sidewalks if road classification, traffic volume, and amount of truck use warrants. Otherwise, a shared use path may be a suitable pedestrian facility in less dense areas of the city or used in conjunction with environmental amenities.

Even if vehicular connectivity is difficult, pedestrian connectivity should always be considered with all new developments and redeveloped land. (These might include: pass-through routes at the end of cul-du-sacs, shared use paths along riparian corridors or MSD easements.)



Accessible pedestrian railroad crossing



Accessible surfaces includes detectable warnings where the sidewalk transitions to the asphalt pavement

Shared Use Paths

Shared Use Paths are a shared facility for pedestrians and bicyclists that may or may not be associated along a roadway. The walking surface shall be accessible, firm, stable, and slip-resistant as ADAAG dictates. AASHTO requires it to have all-weather surfacing. The minimum of ten feet shall be used for all shared use paths while 12 feet is a preferred width. The size allows for two-way travel as well as for maintenance vehicles to clean accordingly. The ADAAG and AASHTO guides shall also apply to shared use paths for slopes and cross-slopes

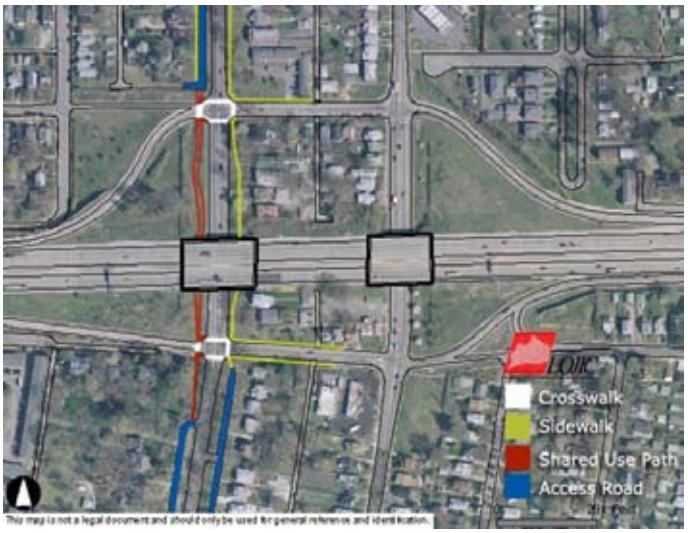
Interchange Crossings

Pedestrians and bicyclists should have facilities that allow them to transverse an interchange. Due to the confined space under interchanges, the bicycle facilities should become shared use paths prior to crossing the ramps. Ideally, the ramps would be signalized and allow for bicycle and pedestrian crossing and access along the roadway under the interchange. Then after the crossings have occurred, the bicycle facility can continue in its original form. All design decisions concerning crossings must be approved by both State and Federal officials due to their jurisdiction of the roadways.

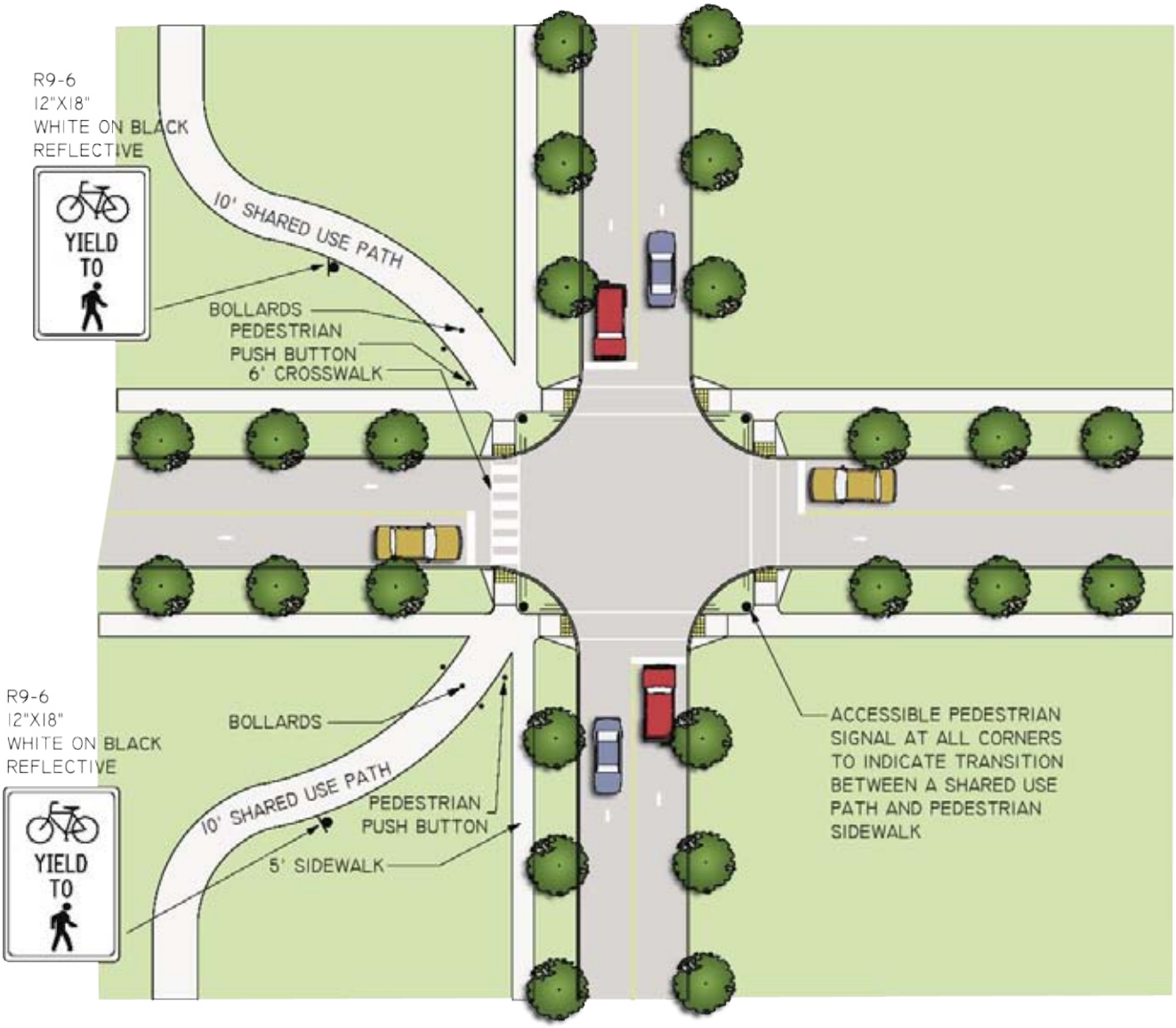
Shared Use Path at Witherspoon and Preston

Shared Use Path/Interchange Concept at Bardstown Road and I-265

Shared Use Path passing underneath I-65



Shared Use Path on Southern Parkway under I-264



SHARED USE PATH CROSSING AT AN INTERSECTION

SHARED USE PATH AT WITHERSPOON AND PRESTON

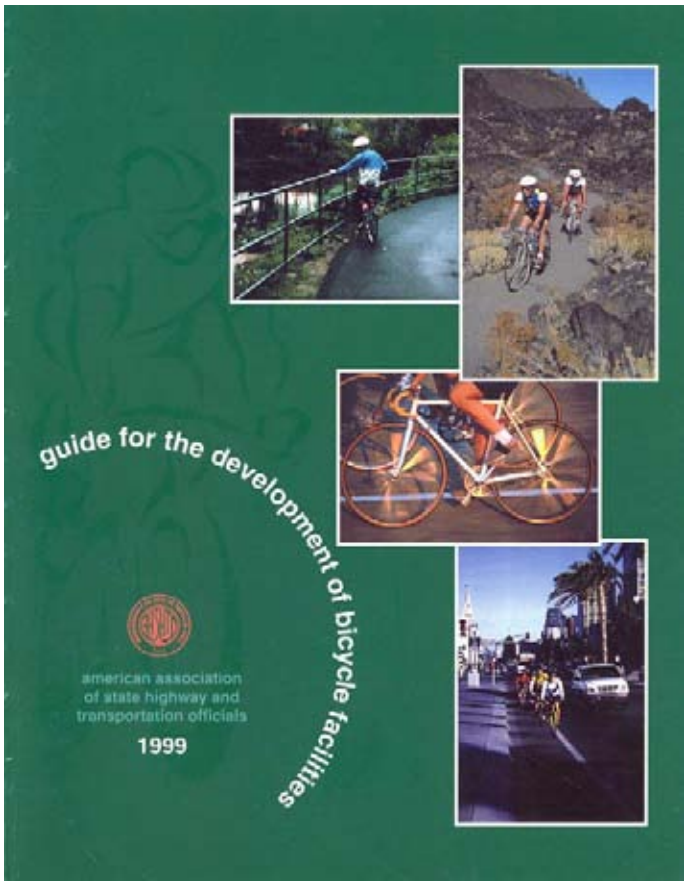
Bicycle Design Criteria

Well-designed bicycle facilities take into account several factors including the skill level of the cyclist, traffic volumes (ADT), road geometrics, Right-of-Way width, mix of vehicle types, presence of on-street parking, sight distance, and the design and spacing of access points. Bicycle facilities are designed either in conjunction with a road corridor or as an "off-road" facility in association with a greenway or shared use path.

This Manual should be used in conjunction with AASHTO's *Guide for the Development of Bicycle Facilities*, which discusses many issues on users, facility types, criteria and design guides for specific problem areas. The Kentucky Transportation Cabinet (KYTC) Road Design Guide Exhibit 1500-01, *Recommended Bicycle Facilities*, on page 33 should also be considered when designing bicycle facilities, which recommends on-road bicycle facilities based on both posted speeds and traffic volumes (ADTs) of the roadway.

Designing on-road bicycle facilities in Louisville Metro presents a number of challenges because a significant portion of the roadway network already exists. Part of the solution involves public education to increase awareness of cyclists rights on the roadways. Another part of the solution is improving existing facilities and adding additional on-road facilities. A level of service analysis was conducted by Louisville Metro, funded by the Kentuckiana Planning and Development Authority (KIPDA), that assessed current bicycle and pedestrian facilities. The study, *Suitability of Louisville Metro Roads for Bicycling and Walking*, suggested several strategies for introducing bicycle facilities into the current roadway network including: reducing the number of motor vehicle lanes; reducing the lane widths; changing the on-street parking; and/or sharing the roadway.

Several facilities allow for bicyclists and motor vehicles to share the roadway including: shared lanes (SL), wide curb lanes (WC), and shoulders (SH) (see page 31). Wide curb lanes, where bikes are adjacent to traffic, should be a minimum of 14' wide. Shared lanes, where bikes are in the lane with traffic, shall have a minimum width of 12'.



AASHTO Guide for the Development of Bicycle Facilities

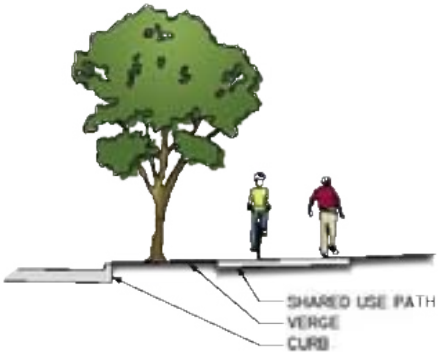
Rumble strips, as they are needed based on the roadway design, shall follow the policy described on the Federal Highway Administration (FHWA) safety website which describes a five foot nominal gap that allows bicyclists to enter and leave a shoulder while still raising the attention of motorists. A Kentucky policy on rumble strips and bicycles is needed. See http://safety.fhwa.dot.gov/roadway_dept/rumble/rumble53001.htm#attachment for more information on the federal guidelines.

Bike lanes shall be provided on both sides of a two-way street and generally placed along each outside lane with the same direction of travel as the motorized traffic (see page 34).

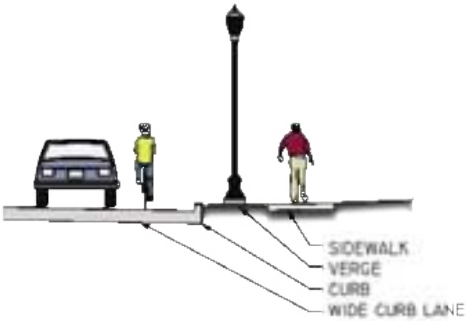
On one-way streets, bike lanes shall be placed in the right-most lane and flow in the same direction of travel as motorized traffic. Advance queues may be installed on one-way streets where there is no on-street parking or right turn lanes. Advance queues are intended to make the bicycle traffic to be more visible to motorists.

STREET EDGE SHOWING JUST SIDEWALK

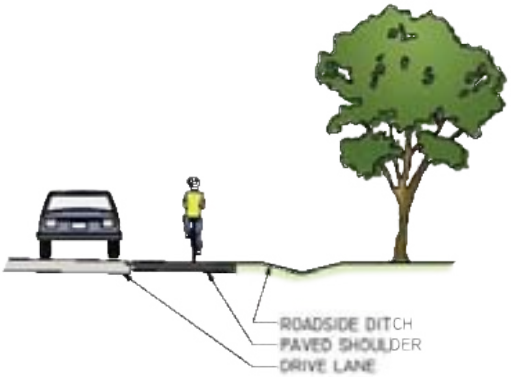
BIKE LANE AND ADJACENT SIDEWALK



SHARED USE PATH WITH BOTH PEDESTRIANS AND BICYCLISTS



WIDE CURB LANE WHERE MOTORISTS AND BICYCLISTS SHARE A WIDER LANE



SHOULDER AS A BICYCLE FACILITY

SHARED LANE WHERE MOTORISTS AND BICYCLISTS SHARE A TYPICAL LANE WIDTH

This is done by having the bike lane's stop bar striped immediately adjacent to the crosswalk while the remaining lanes would have their stop bar six feet further back. Advance queues are only practical where there is a high volume of bicycle traffic to justify their use (page35).

Bicycle lane markings and signs shall be installed in accordance with Chapter 9C of the Manual of Uniform Traffic Control Devices (MUTCD). Typical signage along bike facilities may include MUTCD signs R4-4, W11-1 & W16-1, R3-16, and R3-16a. Pages 36 and 37 illustrate the coordination of signs and markings typically found at intersections.

Pavement markings typically include arrows to indicate the direction of travel and the bike symbol to indicate the preferential use of the lane (page 36). The bike lane shall be delineated from the motor vehicle traffic using a six inch solid white line. A four inch solid white line may be used on the curb-side of the bike lane to separate it from the parking lane. Thermoplastic pavement markings with a non-slip surface are recommended for delineating the bike lane. Striping shall end at stop bars/pedestrian crosswalks and in most cases, not continue through intersections. Where there is heavy right turn movement, or a bus stop, a broken line shall be used to allow for the turning movement but also to indicate the cyclist merging into the through or turn lane prior to entering the intersection (page 37).

As new facilities are developed or redone on roads with induction loops, the loops should be tested for sensitivity

Vane-style Grate with openings perpendicular to the direction of travel

of smaller vehicles such as motorcycles and bicycles.

All bike facilities including roadways, bike lanes, and shoulders, shall have a smooth surface free of structures and obstacles. Bike lanes shall keep a minimum of 3.5 feet clear from the leading edge of grates or inlets (see inset on page 36). Gutters shall not be significantly sloped to the curb edge thus creating a hazard for bicyclists. Slotted, vane-style grates or grates with narrow openings perpendicular to the direction of travel shall be used if gutter inlets are needed on a bicycle facility.

Bicycle parking shall follow the Land Development Code Appendix 9A, Bicycle Parking Design Manual, 2002. Innovative bicycle parking is encouraged as discussed in the street furnishings section.

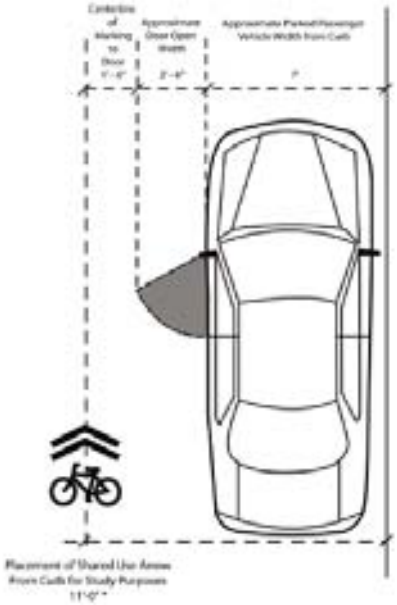
Bicyclist with an advance queue

Artistic bicycle parking at Fourth and Muhammad Ali Boulevard

Shared Lanes

Traffic lanes are often too narrow to be shared side-by-side by bicyclists and passing motorists. Where parking is present, bicyclists wishing to stay out of the way of motorists often ride too close to parked cars and risk being struck by a suddenly opened car door (being "doored"). Where no parking is present, bicyclists wishing to stay out of the way of motorists often ride too close to the roadway edge, where they run the risks of being run off the road, being clipped by overtaking motorists who misjudge passing clearance, or of encountering drainage structures, poor pavement, debris, and other hazards.

Riding further to the left avoids these problems, and is legally permitted where needed for safety. However, this practice can run counter to motorist expectations. The Shared-Lane Marking indicates the legal and appropriate bicyclist line of travel, and cues motorists to pass with sufficient clearance.



Placement of shared use arrow from curb

The Shared Lane Marking is intended to:

1. Help bicyclists position themselves in lanes too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane;
2. Encourage safe passing of bicyclists by motorists;
3. Reduce the chance of a bicyclist's impacting the open door of a parked vehicle in a shared lane with on-street parallel parking;
4. Alert road users of the lateral location bicyclists may occupy; and
5. Reduce the incidence of wrong-way bicycling.

The Shared Lane Marking shown will be used to assist bicyclists with positioning in a shared lane with on-street parallel parking and to alert road users to the location a bicyclist may occupy within the traveled way.

Standard Shared Lane Marking:

If used in a shared lane with on-street parallel parking, Shared Lane Markings shall be placed so that the centers of the markings are a minimum of 3.3 m (11 ft) from the curb face, or from the edge of pavement where there is no curb.

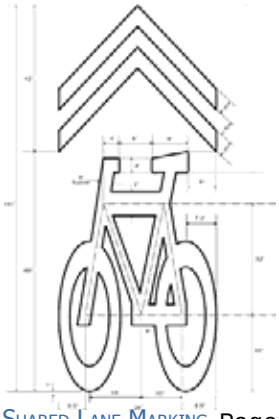
Shared Lane Markings shall not be used on shoulders or in designated bicycle lanes.

The Shared Lane Marking should not be placed on roadways with a speed limit above 55 km/h (35 mph).

When used, the Shared Lane Marking should be placed immediately after an intersection and spaced at intervals not greater than 75 m (250 ft) thereafter.

When the shared lane marking is used, the distance from the curb or from the edge of pavement or paved shoulder may be increased beyond 3.3 m (11 ft).

The Shared Lane Marking shall be made from non-slip, textured thermoplastic material whenever possible.



Shared Lane Marking

RECOMMENDED BICYCLE FACILITY TYPES
RURAL CROSS SECTION

POSTED SPEED LIMIT	AVERAGE ANNUAL DAILY TRAFFIC (AADT) VOLUME (DESIGN YEAR)		
	LESS THAN 2000	2000 - 10,000	OVER 10,000
LESS THAN 30 MPH	12' SL	12' SL (1)	6' SH
30 - 40 MPH	6'-SH	6'-SH	6'-SH
41 - 50 MPH	6'-SH	6'-SH	6'-SH
OVER 50 MPH	6'-SH	6'-SH	6'-SH

RECOMMENDED BICYCLE FACILITY TYPES
URBAN CROSS SECTION (NO PARKING)

POSTED SPEED LIMIT	AVERAGE ANNUAL DAILY TRAFFIC (AADT) VOLUME (DESIGN YEAR)		
	LESS THAN 2000	2000 - 10,000	OVER 10,000
LESS THAN 30 MPH	12' SL	14' WC	5' BL
30 - 40 MPH	5'-BL	5'-BL	5'-BL
41 - 50 MPH	5'-BL	6'-BL	6'-BL
OVER 50 MPH	6'-BL	6'-BL	6'-BL

RECOMMENDED BICYCLE FACILITY TYPES
URBAN CROSS SECTION (PARKING)

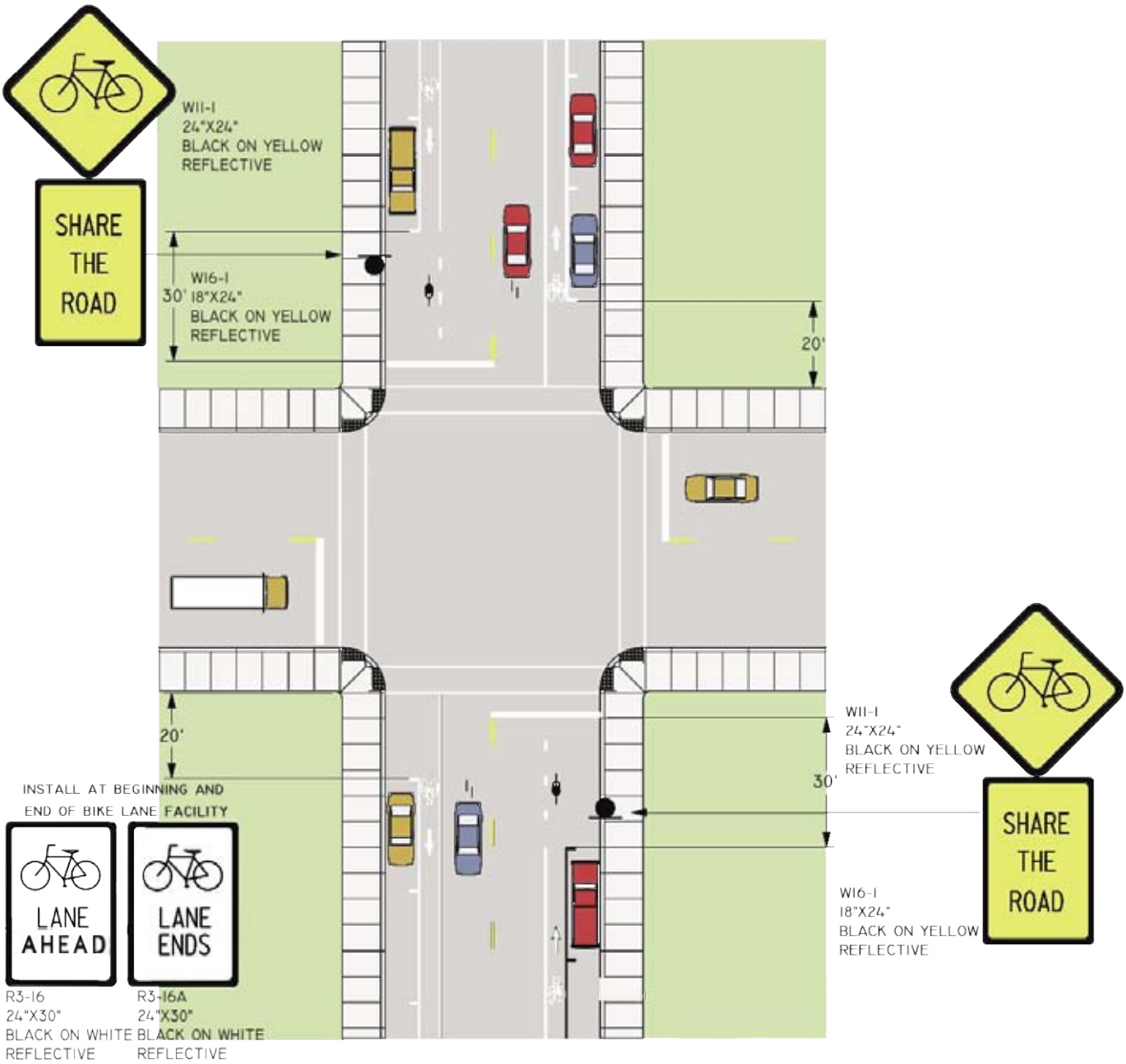
POSTED SPEED LIMIT	AVERAGE ANNUAL DAILY TRAFFIC (AADT) VOLUME (DESIGN YEAR)		
	LESS THAN 2000	2000 - 10,000	OVER 10,000
LESS THAN 30 MPH	14' WC	14' WC	5' BL
30 - 40 MPH	5'-BL	5'-BL	6'-BL
41 - 50 MPH	6'-BL	6'-BL	6'-BL
OVER 50 MPH	NA	NA	NA

LEGEND: WC = WIDE CURB LANE SH = PAVED SHOULDER
SL = SHARED LANE BL = BICYCLE LANE (2)

(1) WHEN PROJECTED TRUCK VOLUMES EXCEED 30 TRUCKS PER HOUR USE 6' - SH.
(2) THE WIDTH OF BICYCLE LANE INCLUDES THE WIDTH OF GUTTER PAN.

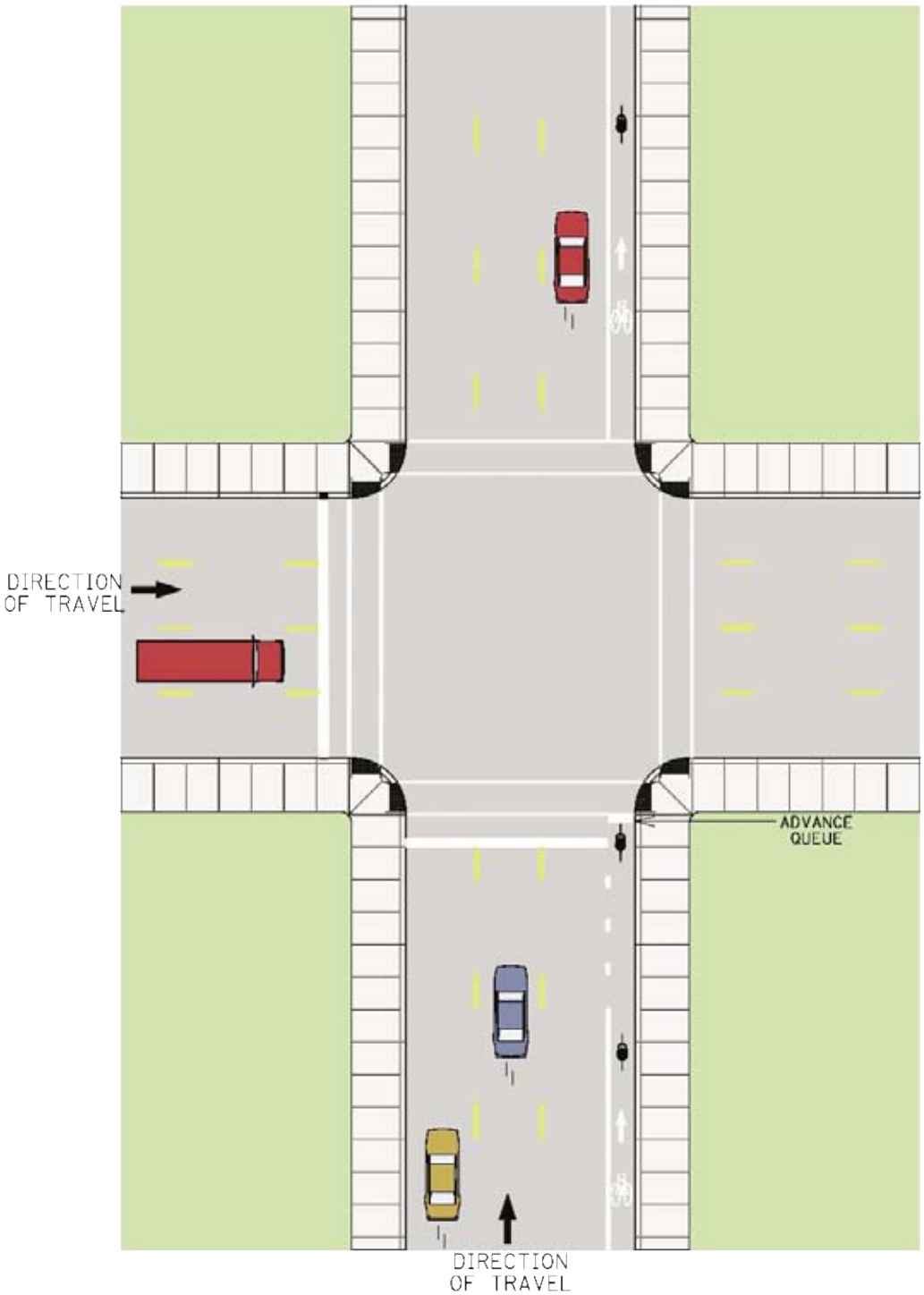
SOURCE: KYTC DESIGN MANUAL

BIKE LANE WITH PARKING
INTERSECTION WITH 2-WAY ARTERIAL STREET



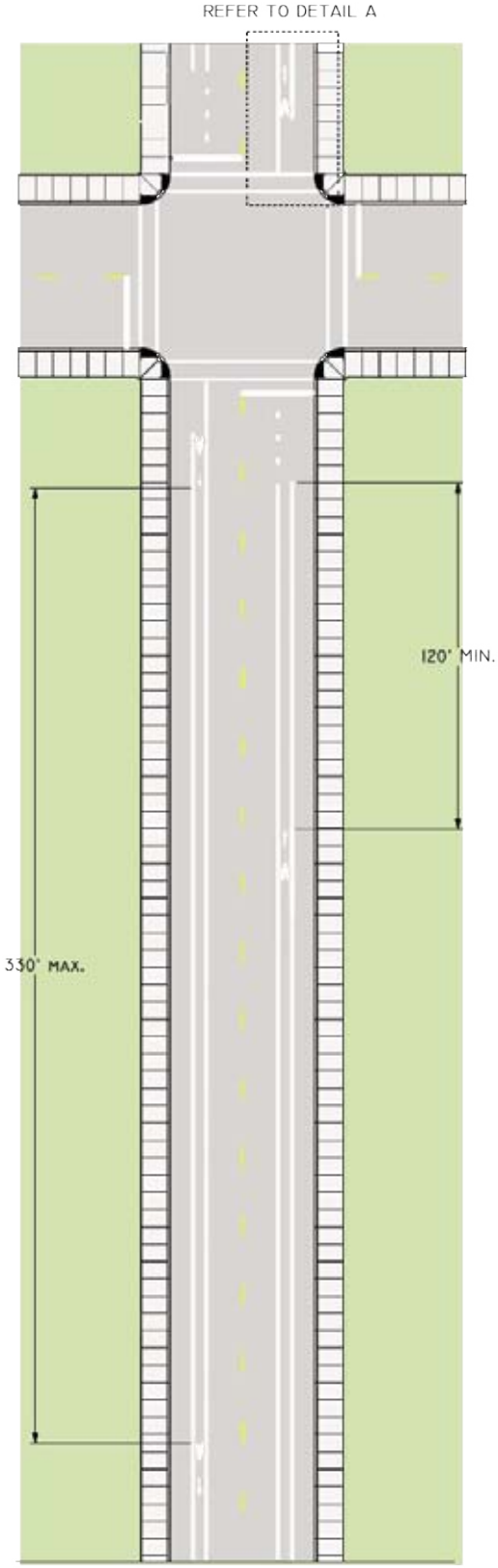
NOTE: BICYCLE SIGNAGE DETAILS LISTED WITHIN APPENDIX

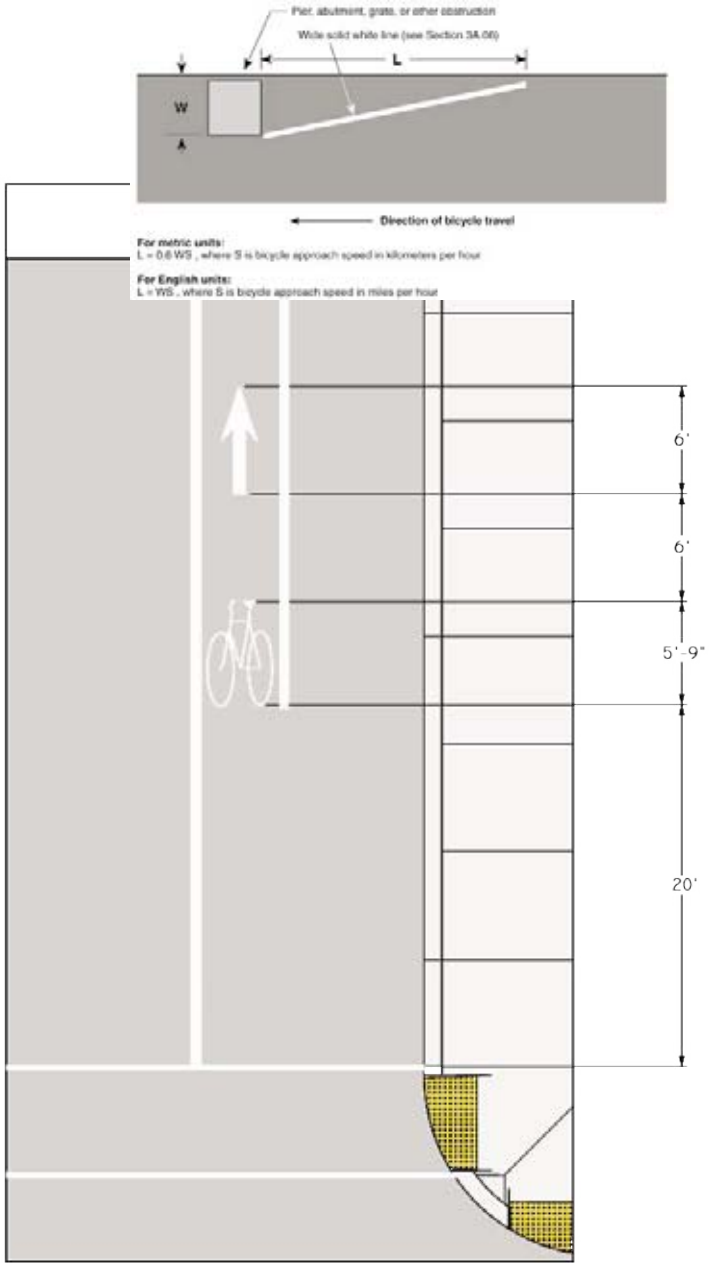
BIKE LANE WITHOUT PARKING
ONE WAY STREET INTERSECTING WITH ONE WAY STREET



NOTE: BICYCLE SIGNAGE DETAILS LISTED WITHIN APPENDIX

BIKE LANE SYMBOL AND ARROW SPACING

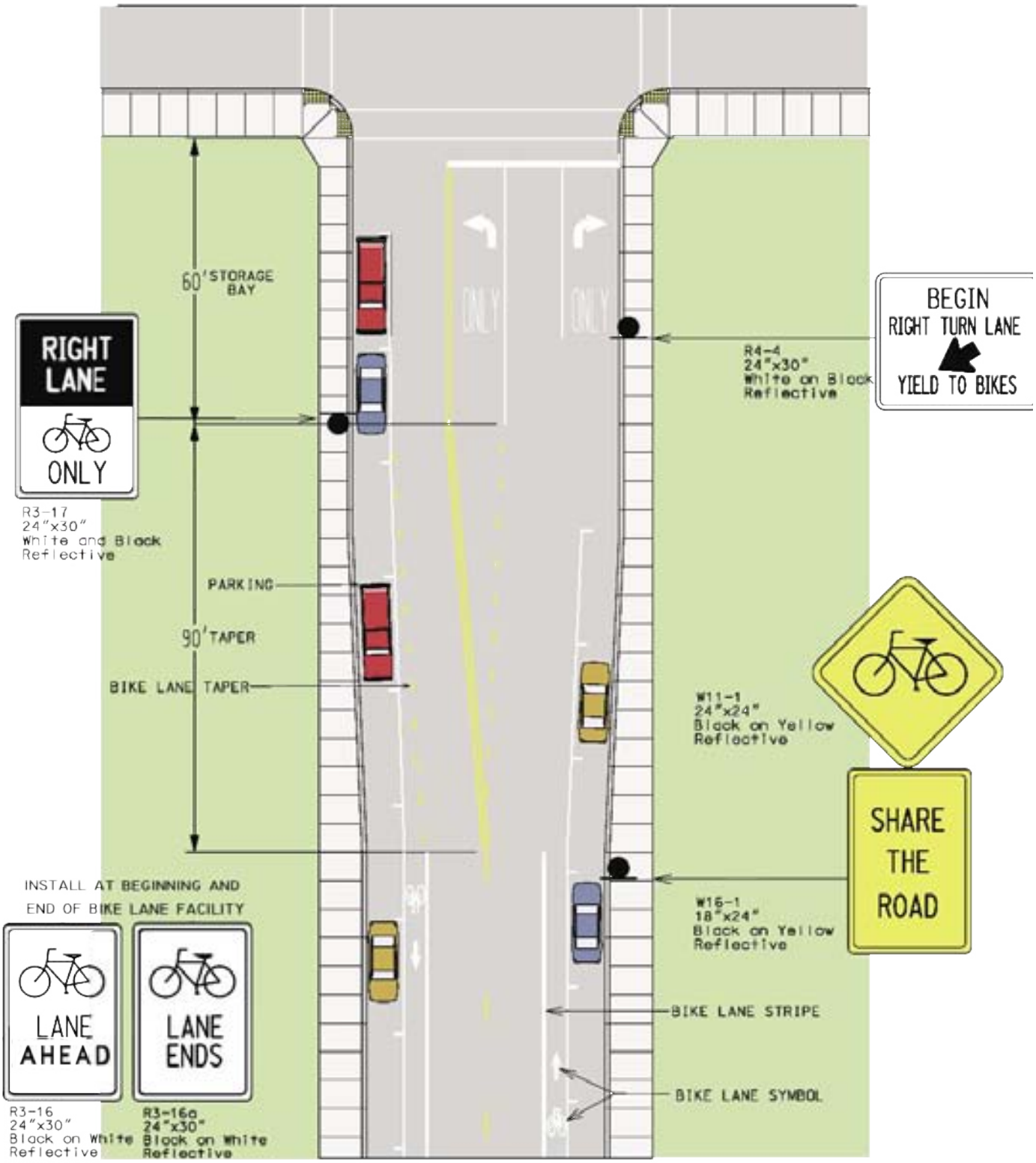




DETAIL A

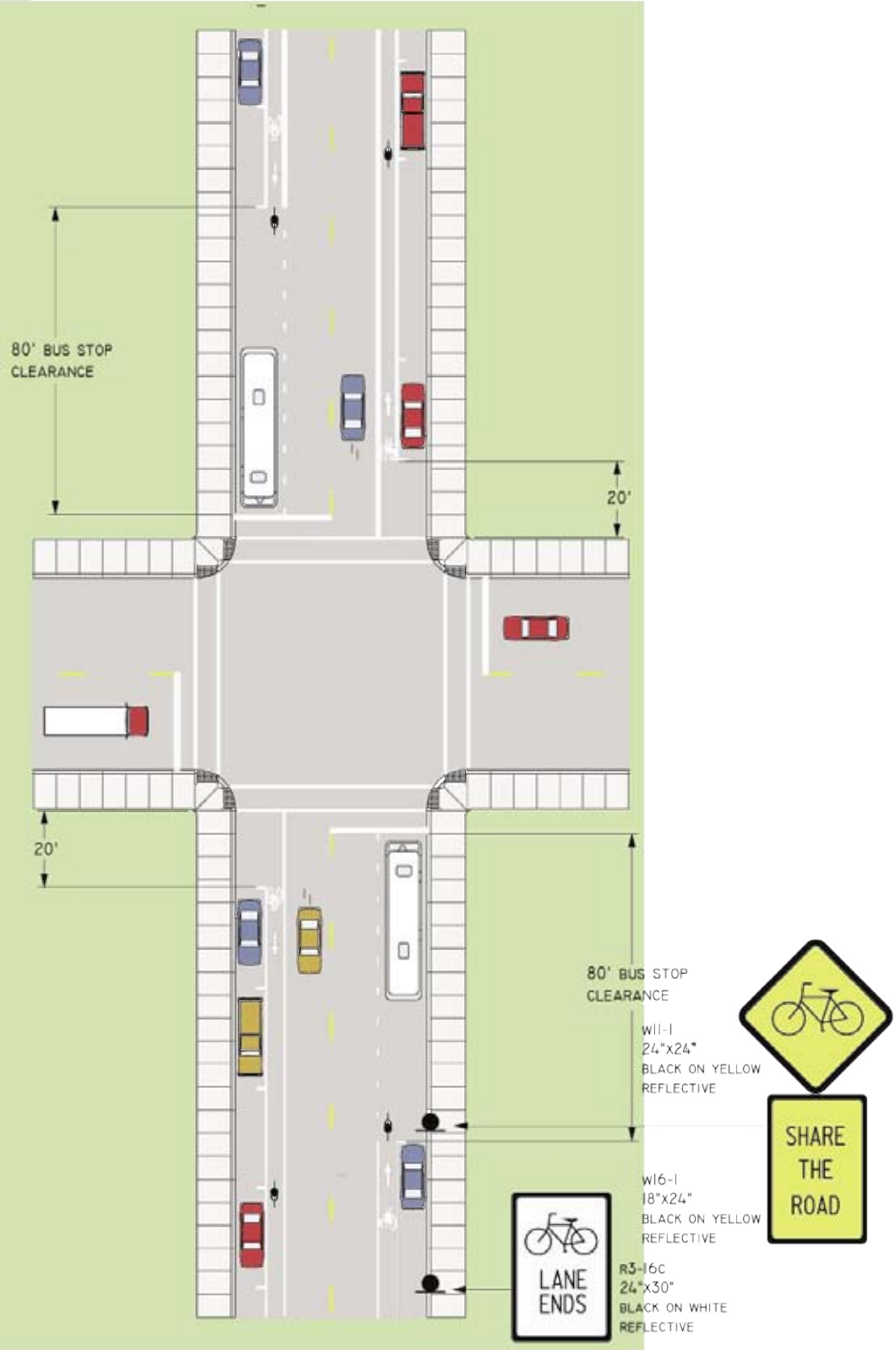
NOTE: BICYCLE SIGNAGE DETAILS LISTED WITHIN APPENDIX

TYPICAL BIKE LANE SIGNAGE



NOTE: BICYCLE SIGNAGE DETAILS LISTED WITHIN APPENDIX

BIKE LANE WITH BUS STOP
NON-CHANNELIZED INTERSECTION



NOTE: BICYCLE SIGNAGE DETAILS LISTED WITHIN APPENDIX

Transit Design Criteria

There are three primary factors to consider when selecting the location and type of transit facility for a development. These factors are the planned use of the development, the scope of the development, and the presence of transit service in the area. Other contributing factors include surrounding land uses, character of the neighborhood, environmental and/or topographic factors, service demands, and transit agency policy. Currently, TARC locates transit facilities based on the percentage of elderly residents in a neighborhood, surrounding land uses, physical constraints, and at the request of a rider.

Transit amenities are provided to ensure that patrons have a safe, accessible, and pleasant location to board a transit vehicle. Therefore, easements should be dedicated to accommodate future transit boarding areas and stops and the shelters, pads and benches associated with them.

Transit shelters or other related objects shall be located either in front of or behind the Pedestrian Zone. Transit shelters shall include seating and an accessible waiting pad connected to the existing sidewalk network. The waiting pad should be a stable, firm surface at least eight feet in length with a clear width of five feet. The grade of the pedestrian waiting pad shall be ADA compliant and should be less than two percent in slope with a preferred curb height between 6 inches and nine inches. Trash receptacles should be located within 20 feet of a transit shelter. Mass transit stops located out of the traveled way with a bus pull off should accommodate only the bus and should not be used for parking.

The minimum criteria for installing a shelter at a bus stop is based on Character Class and boarding volumes as follows:

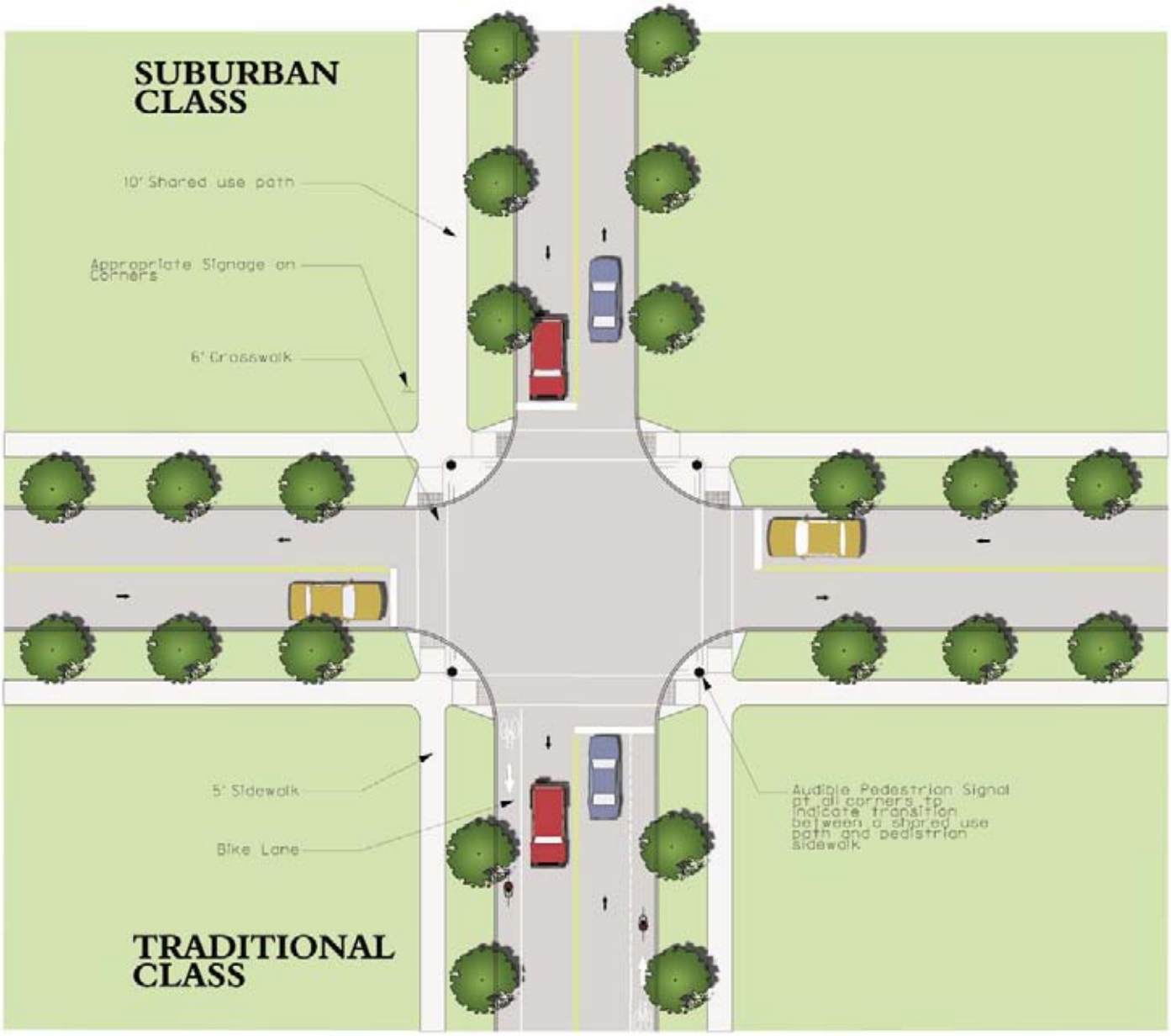
- Rural = 10 boardings a day
- Suburban = 25 boardings per day
- Downtown/Traditional = 50-100 boardings per day

All new transit stops shall conform to TARC's design guidelines.

TARC Bus Shelter at Bardstown Road and Eastern Parkway

TARC buses have bike racks

TARC Bus Stop with Brightside landscaping



TRANSITIONS

The Complete Street facility design criteria contained in this Manual is based on Character Class and Functional Roadway Class. Each typical section in Appendix A conveys relational and dimensional criteria for various facilities as they occur in a given Character Class or on a specific Functional Class of road. However, many of the roadways within Louisville Metro, particularly collector level roads and greater, will traverse more than one Character Class. Roadways may also change from one Functional Class to another as they traverse the county. Both of these conditions create transitional issues associated with a Complete Street facility design.

Character Class transitions will occur at Form District boundaries, when the adjacent Form Districts fall within differing Character Classes. There are four possible Character Class transitions: Downtown-Traditional; Traditional-Suburban; Traditional-Rural, and; Suburban-Rural. Associated with each of these Character Class transitions may be variations in the application of a particular facility. The two most critical variations from a public safety standpoint would be the transition from a shared lane bicycle facility to a dedicated bicycle lane and a sidewalk transitioning to a shared-use path. The appropriate design for these two transitions is illustrated on this page and the next.

It is recommended that a transition in facilities resulting from a change in Character Class occur at the nearest roadway intersection whenever possible. This is particularly important when dealing with an on-road facility such as a bike lane. Changes in landscape character or street furnishings however, can occur at the common property boundary between the two Character Classes rather than the nearest street in order to emphasize the character of the Form District. The design intent of an approved neighborhood plan, corridor study, or Streetscape Master Plan (see Chapter 5, Review and Approval Process) within close proximity to the site should be considered in the design of any transition area.

The possible transitions between the Downtown Character Class and a Traditional Character Class could include:

- Shared lane to dedicated bicycle lane
- Wide sidewalk without a verge to a standard sidewalk with a verge

The possible transitions between a Traditional Character Class and a Suburban Character Class and could include:

- Shared lane to dedicated bicycle lane
- Sidewalk (with or without a verge) to a shared-use path
- Sidewalk with little or no building setback to a sidewalk with a deep building setback

Transition between a Traditional Character Class and a Rural Character Class would most likely occur in a Village Form District between the center and the outlying village. Similar transitions would also occur should a Town Center Form District be established to serve a rural area. The possible transitions between these Character Classes could include:

- Sidewalk (with or without a verge) to a shared-use path
- Shared lane to a dedicated bicycle lane
- Dedicated bicycle lane to a shared lane (not signed) with a shoulder
- Shared lane on a bicycle route (signed) to a shared lane (not signed) with a shoulder
- Dedicated bike lane to a shared use path

Landscape design and the frequency and location of street furnishings would also vary between these two Character Classes as described in previous sections of this chapter.

The possible transitions between a Suburban Character Class and Rural Character Class could include:

- Sidewalk with a verge to a shared-use path
- Dedicated bicycle lane to a shared lane
- Dedicated bicycle lane to a shared lane (not signed) with a shoulder and a shared-use path
- Shared lane on a bicycle route (signed) to a shared lane (not signed) with a shoulder
- Wide curb lane to a shared use path

Bicycle Facility Transitions

Transitioning from one type of bicycle facility to another (such as from a bike lane to a shared-use path) remains an engineering problem around the nation and around the world.

Whenever a transition of this sort is necessary, planners and engineers should refer to national and international best practices and standards of design in all cases. In Portland, Oregon, transportation planners studied lane color transition from European countries and has had success implementing this concept in high conflict situations (see *Portland's Blue Bike Lanes Report*).

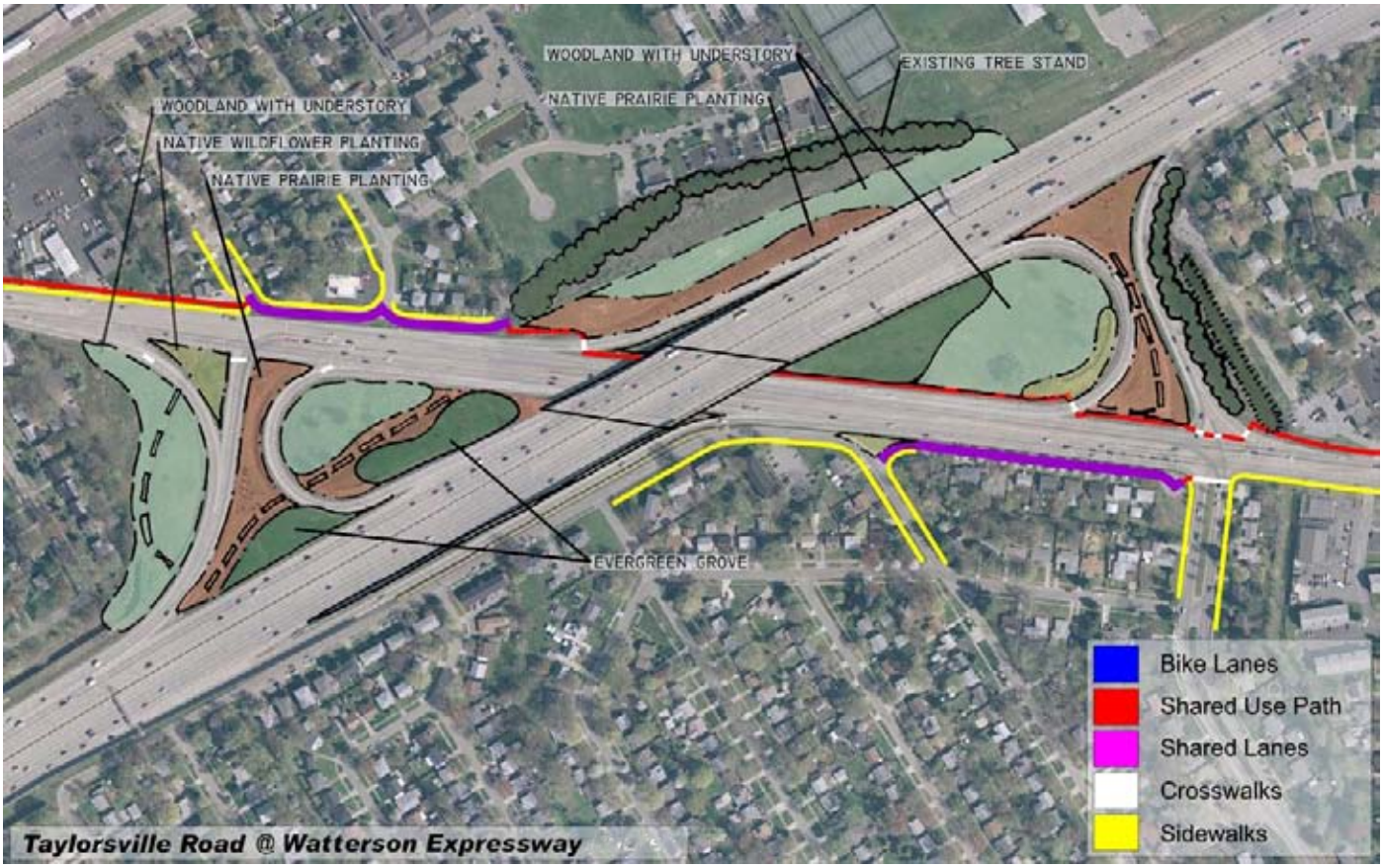
Bike Facility Transition from Bike Lane to Shared Use Path (Source: Portland, OR Office of Transportation)

GATEWAYS/INTERCHANGES

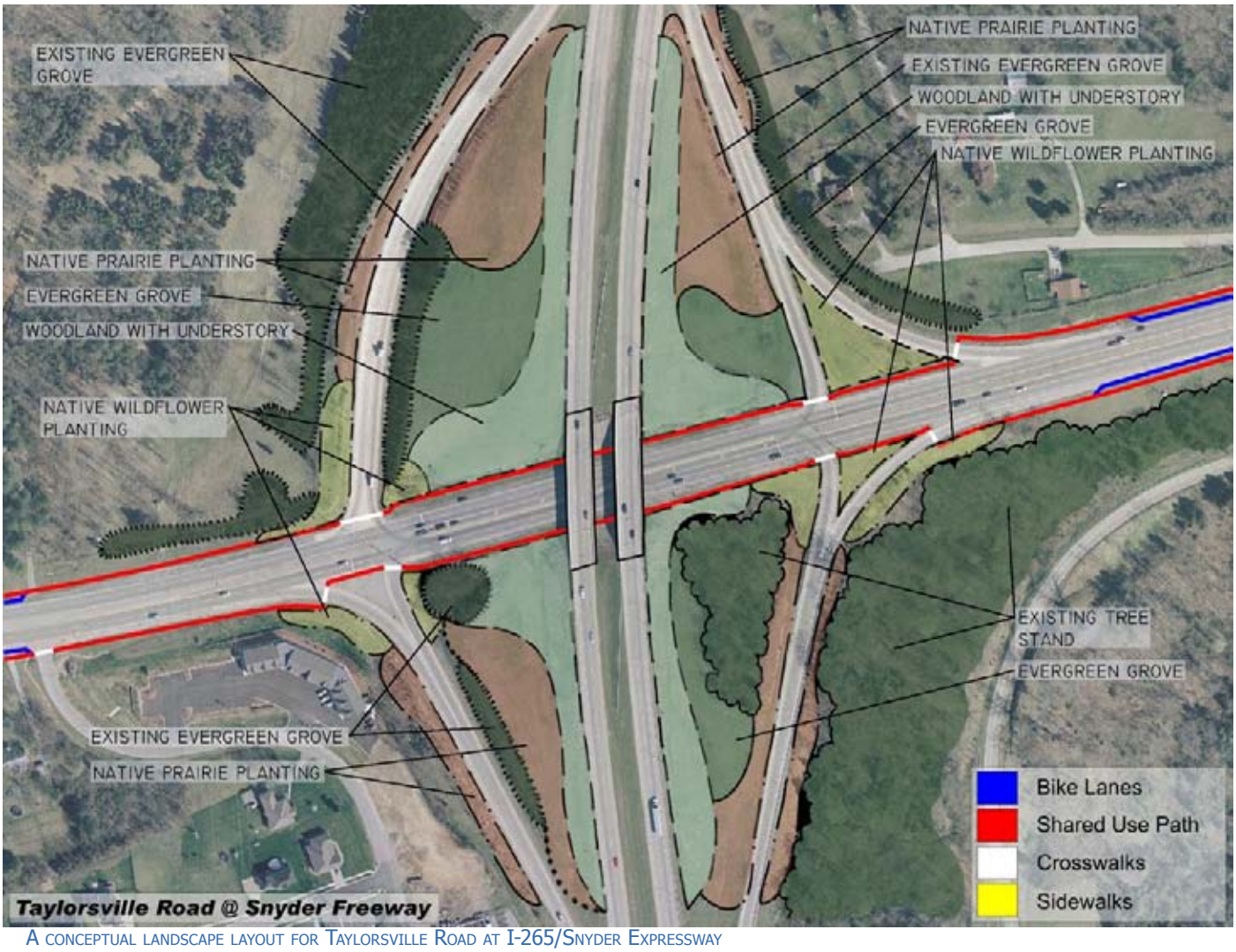
Over a hundred years ago, Louisville's city leaders recognized that great communities are built through careful planning and design. They realized the functional needs of a growing population could be balanced with aesthetics preserving the natural beauty inherent in the native landscape. This is most evident in the parkway system designed by landscape architect, Frederick Law Olmsted. As transportation systems have expanded throughout the city, efforts have been made to incorporate scenic qualities. In the late 1960s, there was enough public interest in fostering the scenic quality of highways that Federal legislation provided funding incentives for roadside enhancements.

On a local level, incentives like Operation Brightside (created in 1986), planning documents such as the 1991 *Highway Beautification Master Plan*, the 1994 *Master Plan for Renewing Louisville's Olmsted Parks and Parkways*, and the policies of the late 1990s continue to recognize the importance of planning and designing aesthetically pleasing and easy to maintain transportation corridors. The Mayor's Strategic Plan for 2004-2007 outlines a vision for a "community all people are proud to call home" where Louisville is a clean and green city that promotes environmental standards in air and water quality, creating sustainable projects, and practicing "responsible stewardship of public assets."

In 1991, the *Highway Beautification Master Plan* was completed due to the leadership of Brightside and collaboration with state and local agencies to result in a plan that balances beauty and function of the transportation corridors. The master plan proposes to "recognize the highway landscape as an extensive system of open space that ties the city together." It establishes that the transportation corridors can be an environmental and visual resource in addition to safely moving large volumes of traffic at high speeds.



A CONCEPTUAL LANDSCAPE LAYOUT FOR TAYLORSVILLE ROAD AT I-264/WATTERSON EXPRESSWAY



A conceptual landscape layout for Taylorsville Road at I-265/Snyder Expressway

A glance at a Kentucky state highway map will immediately show Louisville Metro as a major hub of the state highway system. Three interstates enter Jefferson County to pass through the downtown core and outlying areas of Louisville Metro at the northern, eastern, and southern county lines. This provides the opportunity to implement improvements at the perimeters on the I-64, I-65, I-71, and soon the I-265 corridors for gateway designations. Already, The Ohio River Bridges – Kennedy Interchange project is taking a first step to develop a transportation project that includes mobility for many modes of transportation and landscape guidelines for Spaghetti Junction, segments of I-64/I-71, I-65, and I-64 in the downtown core that create western gateways for Louisville Metro. This project furthers the vision of the *Highway Beautification Master Plan* and could be a model for creating gateways at the northern (I-71), eastern (I-64), and southern (I-65), perimeters of Louisville Metro.

The driver's experience of the highway landscape is primarily a visual one that is viewed at a high rate of speed. However, as drivers are queued off and onto the highways at controlled points, such as interchanges, the vehicle speeds decrease which allows the occupants a prolonged viewing experience of the roadside landscape. Most existing interchanges are large, one-dimensional green planes. They have little landscape interest and are canvases waiting to be painted in shades of green and seasonal colors.

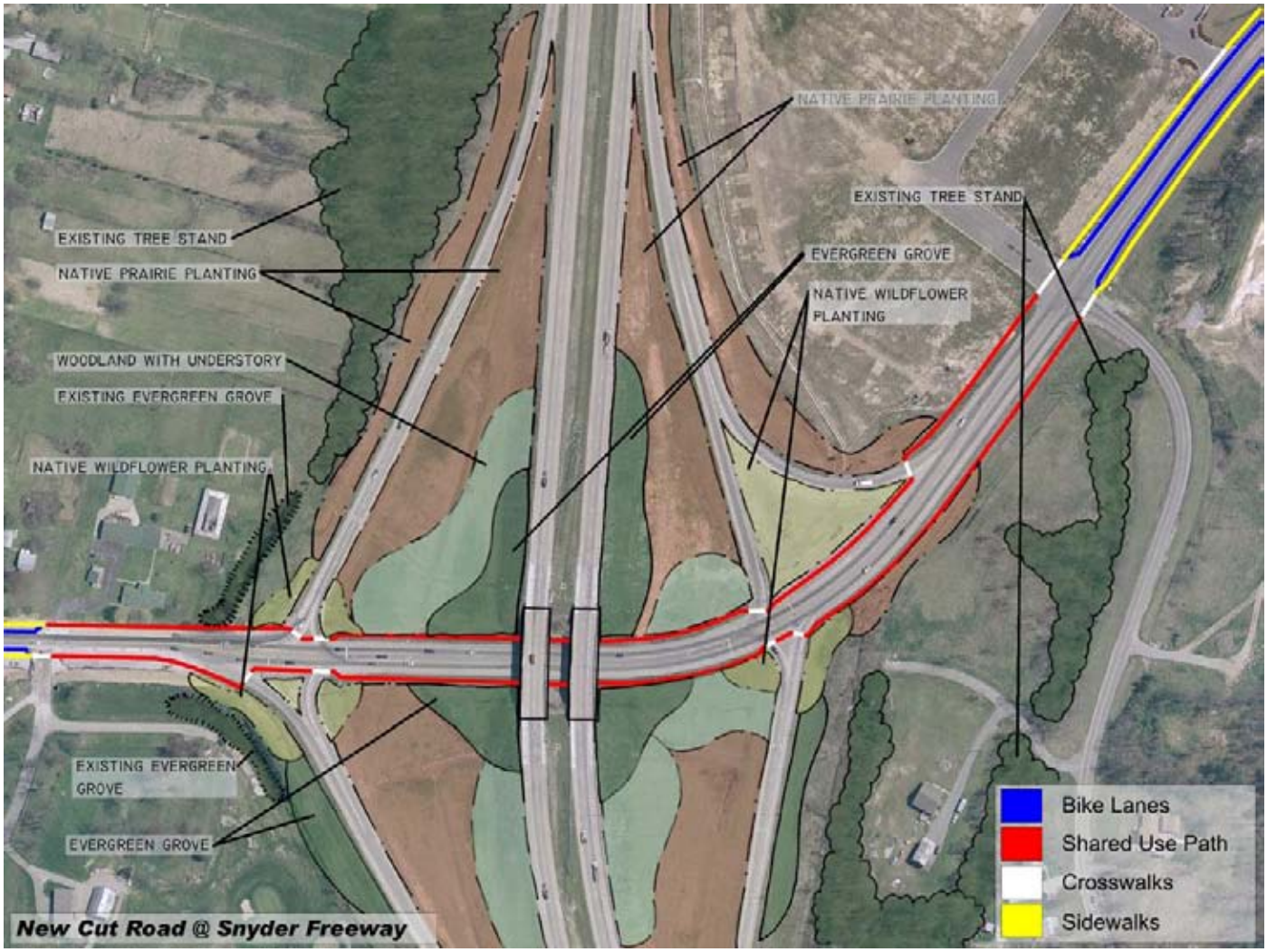
The beautification of all interchanges will require a site-

specific design and should follow the Design Criteria listed in the Highway Beautification Master Plan. In addition, the existing visual quality of an area should be considered when designing the roadside landscape of an interchange. *The Highway Beautification Master Plan* states, "In many ways the roadside landscape extends beyond the right-of-way fence." This is evident in the priority corridors of Taylorsville Road and New Cut Road, which illustrate the differences in the character of interchanges.

Taylorsville Road at I-264 has a physical context of an older residential, urban setting. As Taylorsville progresses east and intersects with I-265, the character of the area is new residential with some retail areas.

New Cut Road has a roadside landscape that extends long beyond the right-of-way fence at the I-265 interchange. As New Cut Road leaves the more urban areas of Louisville Metro, the corridor land uses include a mix of established subdivisions, a historic park, a growing industrial presence, and a sensitive wet woods, which all have a backdrop to the forested knobs of the nation's largest urban forest, the Jefferson Memorial Forest. Each interchange has unique physical context that should be evaluated in the design of the roadside landscape.

Each of the conceptual plans for the highway interchanges demonstrates how the use of native species and massing of plants can create a context sensitive, low maintenance and beautiful landscape around the roadways. The woodland areas should be planted



A conceptual landscape layout for New Cut at I-265/Snyder Expressway

with native hardy canopy trees such as maple, oak and ash. These areas should contain a large portion of colorful understory trees such as redbud and dogwood. The wildflower areas provide splashes of color at the intersections where vehicle speeds are slower. The prairie plantings will also add color while providing a lower maintenance landscape from the typical trimmed lawn areas around most interchange areas. Invasive plants such as crown vetch and burning bush should be removed from the interchange landscape areas. The use of native species will bring natural beauty to the interchanges while protecting some of the natural plant heritage of the area.

The plans and initiatives established by Louisville Metro describe the combined vision and strategies to enhance the transportation corridors and begin to illustrate the partnerships that will be needed for successful implementation. The state highway's long range plans provide the opportunity for developing individual project scopes that include a comprehensive approach to designing transportation corridors that are safe roadways and an environmental and visual resource. The Highway Beautification Master Plan envisions a broad corridor concept plan that utilizes "masses and layers of green, with seasonal accents of color and meadow like openings… [that] become self-sustaining over time." Including landscaping components within a highway construction project to support the master plan's corridor concept is feasible and is exhibited in The Ohio River Bridges project.

In order to plan, design, implement, and maintain the beautification efforts, several project cooperators must be involved; namely: KYTC District 5, Louisville Metro Public Works, Brightside, neighborhood organizations, small cities, and Metro Parks. Partnerships for funding, installation, and maintenance must be fostered and cooperators' efforts in the transportation corridors must dovetail from conception in order to ensure success and longevity of any project. Projects in the highway corridors will be designed on a case by case basis due to the variety of opportunities and constraints of each site. As the project planning progresses, the role of each cooperator can be fully defined. However, the beginnings of some roles can already be outlined. For instance, KYTC District 5 will oversee permitting and promote greener stewardship of the highway right-of-ways at the state level. Brightside can continue their BrightSite efforts to fulfill the corridor concept plan that proposes seasonal accents of color and meadow like openings to compliment the greening of the highway "open space" landscape.

Chapter 5: Review and Approval

Purpose

Streetscape design should be considered as part of the normal review and approval process established within the Louisville Metro Land Development Code. Review of site specific streetscape design requirements should occur as part of the existing development process where plans are reviewed as follows:

- Inspections, Permits, and Licenses (IP&L) - Category 2 development plans
- Development Review Committee (DRC) - Category 3 development plans
- Planning Commission - rezoning cases

Certain streetscape furnishing intended to be placed in a public Right-of-Way should be reviewed and permitted by the agency with jurisdictional authority. Such furnishings would include:

- Tree Grates
- Planters/Pots
- Newspaper Racks
- Kiosks

Streetscape Master Plan

A Streetscape Master Plan (Master Plan) serves as a guide for future development along a designated roadway corridor. The Master Plan would provide continuity for the roadway corridor or block face by establishing a plan for:

- Appropriate bicycle and pedestrian facilities
- Access management and connectivity
- Street trees
- Unified streetscape lighting and furnishings, where required

Typically, the Master Plan provisions are implemented over time by multiple property owners as parcels on the block develop or re-develop. The information contained

Streetscape Master Plan for Shelbyville Road in Middletown

in a Master Plan should provide a sufficient level of detail to allow implementation of the streetscape to occur either incrementally or at one time, through multiple or single sources, yet maintain a consistent character. A Master Plan should include:

- Existing Context Statement
- Design Intent
- Baseline Inventory (redevelopment/infill projects)
- Conceptual Design Recommendations
- Suggested maintenance plan

A Master Plan may also address additional design issues dependent on the individual project including:

- Suggested phasing
- Roadside drainage improvements to increase safety and visual quality
- Preliminary cost opinions (publicly funded projects)

The conceptual design recommendations should address:

- Typical cross section
- Style and placement of public amenities such as benches, bike racks, trash receptacles, and lighting

- Placement and general design of landscape beds, parking screening, street trees and other landscaping
- Pavement and pavement edge treatments to improve safety and pedestrian/vehicular accessibility
- Sidewalk improvements including the location of new sidewalks, extension and/or repair of existing sidewalks, and recommendations for sidewalk materials, widths, and other design considerations
- Ways to make pedestrian linkages more pedestrian friendly and aesthetically pleasing
- General treatment and style of signage to improve effectiveness and create a more coherent appearance for the area

Review and Approval Process

The review and approval process for Master Plans would depend on the nature and magnitude of the project. In considering the appropriate level of review and approval, Master Plan projects should be divided into two categories—New Road projects and Infill/Existing Roadway Reconstruction projects.

New Road Projects

New Road Projects would consist of any development proposing a new public or private roadway associated with a previously undeveloped/unimproved tract or tracts of land. The review of any applicable streetscape design criteria associated with a New Road Project would occur as part of the established plan review process.

Redevelopment/Infill Projects

Redevelopment and/or infill projects will alter the existing streetscape, directly impacting land uses found adjacent to the corridor today as well as current users of the roadway itself. As such, the Streetscape Master Plan review and approval process for redevelopment or infill projects should be subject to an expanded public process. Such projects should follow a process similar to the neighborhood planning process contained in the Louisville Metro Code of Ordinances.

All Streetscape Master Plans should consider the regional context of the area to ensure appropriate transitions between corridors or segments of corridors, particularly when the area of one Streetscape Master Plan connects to or crosses another planned area.

Any area that is included in the approved Streetscape Master Plan shall have a landscape plan approved prior to requesting a building permit. The landscape plan shall conform to the standards of the streetscape master plan. The streetscape master plan will also require that the property owners shall be responsible for maintenance of streetscape elements as required by an approved streetscape master plan.

Where ever possible Streetscape Master Plans should consider approved neighboring streetscape master plans or planning documents to provide continuity along the corridor.

GLOSSARY

ADA: Americans with Disabilities Act

ADT (Average Daily Traffic): The average number of vehicles per day that pass over a given point.

Access: A way or means of approach to provide vehicular or pedestrian physical entrance to a property.

Access Management Standards: Local public safety or public works regulations that control vehicular movement between streets and abutting private land uses, including curb cut size, location and spacing standards, raised medians and raised traffic islands; regulations prohibiting left and/or right turns into or out of driveways and/or streets; curb parking restrictions; grade separations; and circumstances requiring the construction of frontage roads.

Accessibility: The ADA requires transit agencies (i.e.TARC) to provide accessible buses or equivalent services to persons with mobility, sensory or cognitive impairments.

Advance queues: Pavement markings at a stop condition that allow bicycle traffic to be more visible to motorists.

Alley: A way, other than a street, that is open to common use; and affords a secondary means of vehicular access to adjoining or adjacent property.

Amenity Zone: The portion of the sidewalk or green space between the curb line Edge Zone and the Pedestrian Zone in which the street furnishings are located. The verge is included in this zone.

Arterial Street: A major thoroughfare, used primarily for through traffic rather than for access to adjacent land, that is characterized by high vehicular capacity and continuity of movement.

Bicycle: A device, upon which any person may ride, propelled exclusively by human power through a belt, chain or gears, and having one or more wheels. (Ordinance 74.07)

Bicycle Lane (BL): A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicycles and/or other non-motorized vehicles.

Bicyclists: Those that ride bicycles as an Advanced cyclist or commuter, Basic bicyclist or Recreational rider, or Child rider.

Block: The aggregate of private lots, passages, rear lanes and alleys, circumscribed by thoroughfares.

Block Face: The aggregate of all the building facades on one side of a block. The Block Face provides the context for establishing architectural harmony.

Boarding Area with seats and shelter*:* Bus boarding area that features a place for seating and a covered waiting area to protect from the elements. Shelters or awnings and benches are the most common elements, but a more creative design concept may be allowed based on approval by the Planning Director and Executive Director of transit agency.

Buffer (or Buffering): Man-made or natural materials or open space having the effect of ameliorating the adverse effects of a land use upon adjoining or nearby land uses and enhancing the compatibility of the use with such adjoining or nearby land uses.

Bus Pull-off*:* A designated portion of the street that buses can stop to drop off and pick up passengers.

Character: The attributes, qualities, and features that distinguish an area, and give it a sense of purpose, function, definition, and uniqueness.

Captive Riders: Persons who are bound to public transportation because of age, disability, income or other circumstances and have no other choice of transportation available to them.

Choice Rider: Riders who own their own car but choose to use public transit.

Clear Zone Width: The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes and speeds and on the roadside geometry (AASHTO *Roadside Design Guide*).

Clear Vision Area: Area above 2 feet and below 8 feet in grade.

Collector: Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials.

Complete Streets: A system of streets designed and operated to enable safe access for all users (pedestrians, bicyclists, motorists and bus riders) of all ages and abilities along and across the street.

Connection (Vehicular): A driveway, street, turnout, or other means of providing for property access to or from controlled access facilities. For the purpose of access, two one-way connections to a property may constitute a single connection.

Corridor: A lineal geographic system incorporating transportation and/or greenway trajectories.

Crossover Access: A way or means of approach to provide vehicular or pedestrian physical entrance to a property across another property or properties

Curb: The stone or concrete boundary at the edge of the pavement of a street, which also usually includes gutters.

Density: The number of residential dwelling units per acre of land, determined by dividing the number of dwelling units by the area of the development site.

Design Speed: The velocity at which a thoroughfare tends to be driven without the constraints of signage or enforcement. There are four ranges of speed: Very Low: (below 20 MPH); Low: (20-25 MPH); Moderate: (25-35 MPH); High: (above 35 MPH). Lane width is determined by desired design speed.

Design Width: The width specification the sidewalk was intended to meet; it extends from the curb or planting strip to any buildings or landscaping that forms the opposite borders of the sidewalk.

Driveway: A private roadway providing access to a street or highway.

Easements: The right of a person, government agency, or public utility company to use public or private land owned by another for a specific purpose

Edge Zone: The area located adjacent to the road pavement including the curb but not the verge.

Fence: Any construction of wood, metal, wire mesh, masonry, or other material, erected for the purpose of assuring privacy or protection, but excluding shrubbery and plantings.

Form District: An area with distinct boundaries, delineated on the Zoning District Map to which a set of regulations governing the pattern and form of development and redevelopment applies.

Functional Class: The process by which streets and highways are grouped into classes, or systems, according to the character of traffic service that they are intended to provide.

Gateway/Interchanges: Interstate interchanges serving as entrances to the city of Metro Louisville

Grade: The average elevation of the finished ground surface; when determining height of structures, it is the average elevation at the outside of a fence or wall, or at the outside walls of a building.

Green: An open space, available for unstructured recreation. The green is surrounded by roadways or the fronts of buildings and, consist of grassy areas and trees.

Greenway: A linear open space at least 50 feet wide or other width as established by a legislatively adopted greenways plan, along either a natural corridor such as a riverfront, stream valley or ridge line, or along a railroad right-of-way converted to recreational use, a canal, scenic road or other route managed for public use including wildlife habitat. Greenways typically link parks, nature preserves, cultural features or historic sites with each other or with populated areas for bicycles and pedestrians.

Grid Street Pattern: A street system that creates similar size blocks and four-way intersections. Grid street pattern is common in older neighborhoods and traditional development forms. A standard grid pattern is characterized by straight streets, 90 degree intersections and rectangular blocks. In a modified grid, a connected system of curvilinear streets may replace the more formal grid pattern, to insure compatibility with adjacent development and to address physical features of the site.

High Occupancy Vehicle Lanes*:* Where one or more lanes in a roadway are reserved for carpools, van pools, and buses.

Highways: Every way or place of whatever nature when any part of it is open to the use of the public, as a matter of right, license or privilege, for purpose of vehicular traffic.

Historic District: An area designated by a local government or Historic Commission or Board which includes or encompasses such historic sites, landmarks, buildings, signs appurtenances, structures, or objects as may be determined to be appropriate for historic preservation.

Infrastructure: Facilities and services needed to sustain industry, residential, commercial and all other land use activities.

Landscaping: Treatment of land comprising a building site or easement which consists of, but is not limited to, the use of grass, ground covers, shrubs, vines, hedges, trees, berms and architectural landscape features and material, for the visual and functional purposes of the site.

Local: Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement.

Major Thoroughfare Plan: Includes a plan depicting all collectors, arterials, and limited access roads but does not include local roads.

Master Plan: A master plan as required by a Planned Development District detailing the specific requirements and layout for the development of a particular area.

Median: The physical or painted separation provided on divided highways between two adjacent roadways.

Mobility: The ability to move or be moved from place to place.

Motor vehicle: Any vehicle that is propelled by other than muscular power and that is used for transportation of persons or property over the public highways of the state, except road rollers, mopeds, vehicles that travel exclusively on rails, and vehicles propelled by electric power obtained from overhead wires.

Motorist: Someone who drives or travels in an automobile.

Open Space: Any publicly dedicated or privately owned area of land or water that is permanently preserved and maintained. Such an area may be predominately in a natural condition or improved or modified for uses such as recreation, education, aesthetics, cultural or natural resource management or public health and safety.

Park: A relatively large open space available for recreation and usually located at the edge of a development, neighborhood or village. It may be surrounded by roadways, the fronts of buildings, or the side or rear of publicly or privately owned lots. It is usually partially fronted by buildings and has a landscape which may consist of natural areas, paved paths and trails, some open lawn, trees, recreational facilities and open shelters, and requires substantial maintenance.

"Park and Ride" – A service that offers customers a place to park their car, and then transfer to a transit service to complete their journey.

Passage (PS): A pedestrian connector passing between buildings, providing shortcuts through long blocks and connecting rear parking areas to frontages. Passages may be roofed over.

Path (PT): A pedestrian way traversing a park or rural area, with landscape matching the contiguous open space. Paths should connect directly with the urban sidewalk network.

Pavement Width: The width of the pavement of a street, as measured from edge to edge but excluding the curbs, if any.

Pedestrian: Any person afoot or in a wheelchair.

Pedestrian Access: An improved surface which connects the public right-of-way with private property or a building entrance.

Pedestrian and Bicycle Corridor: A linear open space at least 30 feet wide, containing a pathway for pedestrians and/or bicycles and providing linkages within, between and among developments, neighborhoods and the community as a whole.

Pedestrian Way: A right-of-way dedicated to or set aside for public use, which cuts across a block to facilitate pedestrian access to adjacent streets and properties.

Pedestrian Zone: A portion of the sidewalk that is maintained free of any obstructions to allow for the passage of pedestrians.

Primary Street: The street with the highest functional class abutting a property. Where there is more than one street with the same functional class abutting a property, the Planning Director or designee shall determine the primary street for the site. There shall be only one primary street adjacent to a property.

Primary Trip: Trips that have a specific intended destination.

Private Frontage: The privately-held layer between the frontage line and the principal building façade. The structures and landscaping within the Private Frontage may be held to specific standards. The variables of Private Frontage are the depth of the setback and the combination of architectural elements such as fences, stoops, porches and galleries.

Private Roadway: A road, thorough-fare, alley, or bridge within an access easement that is privately owned and maintained.

Public Frontage: The area between the curb of the vehicular lanes and the front property line. Elements of the Public Frontage include the type of curb; walk, planter, street tree and streetlight.

Public Realm: In the context of the Traditional Neighborhood Form, the area of the lot occupied by the public right-of-way and the area in front of the principal structure or to the required principal structure setback/build-to line.

Public Roadway: As a road, thorough-fare, alley, highway, or bridge under the jurisdiction of a public agency.

Public Transportation: Transportation by bus, rail, or other conveyance, either publicly or privately owned, which provides to the public general or special service on a regular and continuing basis. Also known as "mass transportation," "mass transit" and "transit."

Refuge Island: A raised longitudinal space separating the two main directions of traffic.

Right-of-Way: The streets, parkways, sidewalks, pathways and other land over which the public has a right of passage or land over which a rail line passes.

Road (RD): A local, rural and suburban thoroughfare of low vehicular speed and capacity. Its public frontage consists of swales drained by percolation and a walking path or bicycle trail along one or both sides.

Roadside: The areas between the outside edges of the shoulders and the Right-of-Way boundaries. Unpaved median areas between inside shoulders of divided highways and infield areas of interchanges are included.

Roadway: The strip of land through which a road is constructed and which is physically altered.

Rumble strips: Raised or grooved patterns constructed on, or in travel lane and shoulder pavements.

Rural Section: A cross-section of roadway that does not use curb and gutter, provides an above-ground stormwater system, and typically does not contain sidewalks.

Sidewalk: The paved layer of the public frontage dedicated exclusively to pedestrian activity.

Sight Distance: The length of roadway ahead over which an object of a specific height is continuously visible to the driver.

Screening: The use of solid fencing or dense vegetative plantings to visually block a particular use from an abutting or adjacent use. See also "Buffer."

Secondary Trips: Incidental trips; trips that might deviate from the original purpose of a primary trip and that would probably not be taken if the individual was not already making a trip.

Shared Access: A way or means of approach to provide vehicular or pedestrian physical entrance to properties with a shared property line.

Shared Lane (SL): A “standard width” travel lane that both bicycles and motor vehicles share.

Shared Use Path (SUP): A path physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheel chair users, joggers, and other non-motorized users. It is the same term as “multi-use trail.”

Shoulder (SH): A paved portion of the roadway to the right of the traveled way that may serve bicyclists, pedestrians, and others.

Sight Distance Triangle: An area at the intersection of roadways free of obstruction in the vertical plane.

Storefront Zone: The portion of the sidewalk located between the Pedestrian Zone and the building façade.

Street: Any public way or legally created private way for vehicular traffic used as a means of access to lots abutting thereon, and including the following:

(a) Major Arterial -A street primarily for through traffic, usually on a continuous route.

(b) Minor Arterial -A secondary way or highway for use primarily as a connector for major arterials, minor arterials, or between a minor arterial and a collector.

(c) Collector -A street intended to move traffic from local streets and other collectors to the arterial street system. A collector street serves a neighborhood or large subdivision and should be designed so that no single family residential properties face onto it. Collector level streets are those streets either designated as such by the Comprehensive Plan for Louisville and Jefferson County, or by the Director of Works.

(d) Local -A street used primarily for access to abutting property.

(e) Cul-de-sac -A street ending in a turn-around and designed not to be extended.

(f) Stub street -A street usually ending at a property line which is designed to be extended in the future.

(g) Through street -A local street or segment of a series of local streets which provides at least two separate points of access to a collector, arterial or another through street. Certain street segments not meeting this requirement may be designated a through street if approved by the County Engineer. All arterial and collector streets are designated as through streets. (See also "Grid Street Pattern" in the *Land Development Code*)

Streetscape: The visual character that establishes a major part of the public realm. The streetscape is composed of thoroughfares (travel lanes for vehicles and bicycles, parking lanes for cars, and sidewalks or paths for pedestrians) as well as the visible private frontages (building facades and elevations, porches, yards, fences, awnings, etc.), and the amenities of the public frontages (street trees and plantings, benches, streetlights, etc.).

Street Tree: A tree and/or group of trees planted (typically in a linear fashion) usually within verges, medians, or along streets – to enhance visual quality of a street, to provide spatial enclosure, to provide canopy coverage (shade) over pavement, as well as other technical benefits. Coniferous trees shall not be used as street trees. Refer to LDC appendix 10 A for preferred street trees.

Street Wall: Vertical plane at the right-of-way line created by the façade of a structure or series of structures along a given block face.

Suburban Form Districts: Those form districts that follow a more suburban pattern of development, the following are Suburban Form Districts: Neighborhood Form District, Suburban Marketplace Corridor Form District, Suburban Workplace Form District, Regional Center Form District, Village Form District "Outlying" and Campus Form District.

Terminal Trips: The pedestrian portion of a trip that was primarily made through the use of another mode of transportation.

Traditional Form Districts: The following form districts shall be considered traditional form districts: Town Center Form District, Traditional Neighborhood Form District, Traditional Marketplace Corridor Form District, Traditional Workplace Form District and Village Form District "Center".

Transit: Facility consisting of the roads and equipment necessary for the movement of passengers or goods.

Transit Route: A type of transit service that operates as a fixed route along a fixed alignment or path with scheduled times for arrival and departure at terminal.

Transit Stop*:* A location where passengers board and alight. Bus stops can serve one or more routes and include various levels of amenities depending on the level of actual or anticipated ridership.

Transitions: A change from one place or state to another such as between Character Districts or between different modes of travel (i.e. bike lane to shared use path).

Traveled Way: The portion of the roadway provided for the movement of vehicles, exclusive of shoulders.

Tree: Any self-supporting woody plant of a species which normally grows, or is capable of growing, to an overall height of a minimum of fifteen feet in the north central region of Kentucky. This term includes canopy trees and understory trees, but does not include shrubs, ground cover or containerized trees and nursery stock trees for resale in licensed nurseries.

Tree Canopy: Layer of elevated vegetation from the ground. Tree canopy is measured from the outer edge of the canopy or dripline.

Tree, Type A: A large tree that will reach a mature height of over fifty (50) feet. (See LDC Preferred Plant List)

Tree, Type B: A medium tree that will reach a mature height of approximately twenty-five (25) to fifty (50) feet. (See LDC Preferred Plant List)

Tree, Type C: A small tree that will reach a mature height of approximately ten (10) to twenty-five (25) feet. (See LDC Preferred Plant List)

Tree, Understory: Any self-supporting woody plant of a species which normally achieves an overall height at maturity of 15-35 feet and a minimum crown spread of 15 feet, and which can grow beneath larger canopy trees.

Type: A category determined by function, disposition, and configuration, including size or extent. There are community types, street types, civic space types, etc.

Thoroughfare: A vehicular way incorporating moving lanes and parking lanes within a right-of-way.

Vehicle: Vehicles that have their own motive power and that are used for the transportation of people or goods on streets. *Motor vehicle* includes motorcycles, passenger vehicles, trucks, and recreational vehicles with motive power.

Vehicle Design Speed: A selected speed used to determine the various geometric design features of the roadway.

Vehicle, Passenger: A motor vehicle designed to carry ten (10) persons or less including the driver. Passenger vehicle also includes motor vehicles designed to carry ten (10) persons or less that are constructed either on a truck chassis or with special features for occasional off-road use. Passenger vehicle includes vehicles commonly called cars, minivans, passenger vans, sports utility vehicles (SUVs) and jeeps. Passenger vehicle is intended to cover the vehicles defined as passenger cars and multipurpose passenger vehicles by the National Highway Traffic Safety Administration.

Verge: A strip or border with grass or landscaping that separates the sidewalk from the street. (Referred to as the planted strip or utility strip by transportation engineers.)

Wide Curb Lane (WC): An outside travel lane with a width of at least 14 feet to accommodate both bicyclists and motorized vehicles for shared use.

Yard: An open space, other than a court, on the same lot with a building, unoccupied and unobstructed from the ground upward.

Yard, Front: A yard extending across the front of a lot, between the side lot lines, and being the minimum horizontal distance between the street right-of-way line and the principal building or any projections thereof other than the projections of uncovered steps, uncovered balconies or uncovered porches. On corner lots the front yard shall be considered as parallel to the street on which the lot has its least dimension.

Zoning District: Any area within Jefferson County delineated on the Zoning District Map to which a set of regulations governing permitted land use, density and intensity of development applies.

Zoning District Map: The map setting forth the boundaries of the zoning and form districts of all of Jefferson County, Kentucky.

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Appendix A - Sections and Signage

Introduction

The sections that follow are based on joining the functional class and the character class into a Complete Street. The Thoroughfare Typology chart, shown on page 24, shows how the roadway and user facilities interact with the character class of each part of Louisville Metro. The sections follow the aforementioned Edge Zone, Amenity Zone, Pedestrian Zone, and Storefront Zone concepts with actual user facilities and dimensions. The intent is to allow flexibility in the Complete Street design using sound engineering judgment and context-sensitive design.

The rural character class sections are drawn at their full width. Environmental constraints such as waterways, steep longitudinal and cross slopes, and sensitive landscapes may constrain the potential for a roadway to meet the width guidelines shown. Sound engineering judgment may be used to vary or justify smaller sections. If alternatives are needed, pedestrian and bicycle facilities should be provided in alternate but connecting locations using 'in-lieu of' fees or other funding sources.

The facilities are shown in bird's eye or plan view as well as in a cut away or section view to reveal the different parts of the right-of-way. The sections show the relationship of different facilities by demonstrating their location, interaction with the other users facilities, and their widths. The drawings have text underneath to describe a portion of the streetscape and its relative size. The widths are given with minimum and preferred distances. The preferred distances are considered typical and are allowed to proceed without variances and/or justification upon review. The minimum distances are shown as the lowest value allowed. Smaller dimensions may be used if variances and/or justification is approved upon more stringent review. Indents in the section's pavement indicate where the lane markings occur.

Facilities Legend

Arterial (Major and Minor)

Arterial Rural Character District

AR-1 2-Way, 4-Lane, Shared Use Path/Sidewalk
AR-2 2-Way, 4-Lane, Designated Turn Lane, Shared Use Path/Sidewalk
AR-3 2-Way, 4-Lane, Median, Shared Use Path/Sidewalk

Arterial Suburban Character District

AS-1 2-Way, 4-Lane, Shared Use Path, Shared-Lane
AS-2 2-Way, 4-Lane, Bike Lane, Sidewalk
AS-3 2-Way, 4-Lane, Wide Curb Lane*, Sidewalk
AS-4 2-Way, 4-Lane, Shoulder, Sidewalk, Shared Use Path
AS-5 2-Way, 4-Lane, Shared Turn Lane, Shared Use Path
AS-6 2-Way, 4-Lane, Shared Turn Lane, Bike Lane, Sidewalk
AS-7 2-Way, 4-Lane, Shared Turn Lane, Wide Curb Lane*
AS-8 2-Way, 4-Lane, Shared Turn Lane, Shoulder, Sidewalk/Shared Use Path
AS-9 2-Way, 4-Lane, Median, Shared Use Path, Shared-Lane

* Wide Curb Lane on Minor Arterial Only

Arterial Traditional Character District

AT-1 1-Way, 4-6 Lane, Parallel Parking, Bike Lane, Sidewalk
AT-2 1-Way 4-6 Lane, Parallel Parking, Shared Use Path*, Shared-Lane
AT-3 2-Way, 4-6 Lane, Shared Use Path*, Shared-Lane
AT-4 2-Way, 4-6 Lane, Bike Lane, Sidewalk
AT-5 2-Way, 4-6 Lane, Parallel Parking, Shared Use Path*, Shared-Lane
AT-6 2-Way, 4-6 Lane, Parallel Parking, Bike Lane, Sidewalk
AT-7 2-Way, 4-6 Lane, Shared Turn Lane, Shared Use Path, Shared-Lane
AT-8 2-Way, 4-6 Lane, Shared Turn Lane, Bike Lane, Sidewalk
AT-9 2-Way, 4-6 Lane, Shared Turn Lane, Parallel Parking, Bike Lane, Sidewalk

* Shared Use Path on Minor Arterial Only

Arterial Downtown Character District

AD-1 1-Way, 4-6 Lane, Parallel Parking, Bike Lane, Sidewalk
AD-2 1-Way, 4-6 Lane, Parallel Parking, Shared-Lane
AD-3 2-Way, 4-6 Lane, Shared-Lane
AD-4 2-Way, 4-6 Lane, Bike Lane, Sidewalk
AD-5 2-Way, 4-6 Lane, Parallel Parking, Shared-Lane
AD-6 2-Way, 4-6 Lane, Parallel Parking, Bike Lane, Sidewalk
AD-7 2-Way, 4-6 Lane, Shared Turn Lane, Shared-Lane
AD-8 2-Way, 4-6 Lane, Shared Turn Lane, Bike Lane, Sidewalk
AD-9 2-Way, 4-6 Lane, Shared Turn Lane, Parallel Parking, Bike Lane, Sidewalk

* Shared Use Path on Minor Arterial Only

Collector

Collector Rural Character District

CR-1 2-Way, 2-Lane, Shared Use Path/Sidewalk
CR-2 2-Way, 2-Lane, Designated Turn Lane, Shared Use Path/Sidewalk
CR-3 2-Way, 2-Lane, Median, Shared Use Path/Sidewalk
CR-4 2-Way, 2-Lane, No Shoulder, Shared Use Path/Sidewalk, Shared-Lane

Collector Suburban Character District

CS-1 2-Way, 2-Lane, Shoulder, Shared Use Path/Sidewalk
CS-2 2-Way, 2-Lane, Median, Shoulder, Shared Use Path/Sidewalk
CS-3 2-Way, 2-Lane, Shared Use Path/Sidewalk, Shared-Lane
CS-4 2-Way, 2-Lane, Bike Lane, Sidewalk
CS-5 2-Way, 2-Lane, Wide Curb Lane, Sidewalk
CS-6 2-Way, 2-Lane, Shared Turn Lane, Shared Use Path, Shared-Lane
CS-7 2-Way, 2-Lane, Shared Turn Lane, Bike Lane, Sidewalk
CS-8 2-Way, 2-Lane, Shared Turn Lane, Wide Curb Lane, Sidewalk
CS-9 2-Way, 2-Lane, Shared Turn Lane, Shoulder, Shared Use Path/Sidewalk
CS-10 2-Way, 2-Lane, Median, Shared Use Path/Sidewalk
CS-11 2-Way, 2-Lane, Median, Bike Lane, Sidewalk
CS-12 2-Way, 2-Lane, Median, Wide Curb Lane, Sidewalk

Collector Traditional Character District

CT-1 1-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
CT-2 1-Way, 2-Lane, Parallel Parking, Shared Use Path, Shared-Lane
CT-3 1-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk
CT-4 2-Way, 2-Lane, Bike Lane, Sidewalk
CT-5 2-Way, 2-Lane, Shared Use Path, Shared-Lane
CT-6 2-Way, 2-Lane, Wide Curb Lane, Sidewalk
CT-7 2-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
CT-8 2-Way, 2-Lane, Parallel Parking, Shared Use Path, Shared-Lane
CT-9 2-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk
CT-10 2-Way, 2-Lane, Shared Turn Lane, Bike Lane, Sidewalk
CT-11 2-Way, 2-Lane, Shared Turn Lane, Shared Use Path, Shared-Lane
CT-12 2-Way, 2-Lane, Shared Turn Lane, Wide Curb Lane, Sidewalk

Collector Downtown Character District

CD-1 1-Way, 2-Lane, Parallel Parking, Shared Lane, Sidewalk
CD-2 1-Way, 2-Lane, Parallel Parking, Shared-Lane
CD-3 1-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk
CD-4 2-Way, 2-Lane, Shared Lane, Sidewalk
CD-5 Reserved
CD-6 2-Way, 2-Lane, Wide Curb Lane, Sidewalk
CD-7 Reserved
CD-8 2-Way, 2-Lane, Parallel Parking, Shared Use Path/Shared Lane
CD-9 2-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk

Local

Local Rural Character District

LR-1 2-Way, 2-Lane, Shared Lane, Shared Use Path/Sidewalk
LR-2 2-Way, 2-Lane, No Shoulder, Shared Lane, Shared Use Path/Sidewalk

Local Suburban Character District

LS-1 2-Way, 2-Lane, Shared Use Path/Shared Lane
LS-2 2-Way, 2-Lane, Shoulder, Shared Use Path/Sidewalk

Local Traditional Character District

LT-1 1-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
LT-2 1-Way, 2-Lane, Parallel Parking, Shared Use Path, Shared-Lane
LT-3 1-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk
LT-4 2-Way, 2-Lane, Bike Lane, Sidewalk
LT-5 2-Way, 2-Lane, Shared Use Path, Shared-Lane
LT-6 2-Way, 2-Lane, Wide Curb Lane, Sidewalk
LT-7 2-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
LT-8 2-Way, 2-Lane, Parallel Parking, Shared Use Path, Shared-Lane
LT-9 2-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk

Local Downtown Character District

LD-1 1-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
LD-2 1-Way, 2-Lane, Parallel Parking, Shared-Lane
LD-3 1-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk
LD-4 2-Way, 2-Lane, Bike Lane, Sidewalk
LD-5 2-Way, 2-Lane, Shared-Lane
LD-6 2-Way, 2-Lane, Wide Curb Lane, Sidewalk
LD-7 2-Way, 2-Lane, Parallel Parking, Bike Lane, Sidewalk
LD-8 2-Way, 2-Lane, Parallel Parking, Shared-Lane
LD-9 2-Way, 2-Lane, Parallel Parking, Wide Curb Lane, Sidewalk

Alley/Lane

Alley/Lane Rural/Suburban Character District

ALS-1 2-Way, 2-Lane, No Shoulder

Alley/Lane Traditional Character District

ALT-1 1-Way, 1-Lane
ALT-2 2-Way, 1-Lane
ALT-3 2-Way, 2-Lane

Alley/Lane Downtown Character District

ALD-1 1-Way, 1-Lane
ALD-2 2-Way, 1-Lane
ALD-3 2-Way, 2-Lane
ALD-4 2-Way, 2-Lane, Wide Curb Lane

Signage

Street Design Guidelines

City of Roanoke, Virginia

July 19, 2007 as revised

Adopted as an
internal design guide
by the Planning Commission.

vision 2001 2020

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Table of Contents

CREATING "GREAT STREETS" 5

FUNCTION AND CHARACTER 9

CHARACTER DISTRICT DESIGN GUIDELINES 16

ARTERIALS 20
DOWNTOWN 25
RECREATION/OPEN SPACE 35
TRADITIONAL NEIGHBORHOOD 38
SUBURBAN NEIGHBORHOOD 42
LOCAL COMMERCIAL AND REGIONAL COMMERCIAL 51
INDUSTRIAL 55

GENERAL STREETSCAPE ELEMENT GUIDELINES 59

BENCHES 59
BICYCLE ACCOMMODATIONS 59
BIKE RACKS 65
BOLLARDS 65
CROSSWALK 65
CURB RAMPS 66
CURB RETURN RADII 68
DRAINAGE GRATES AND INLETS 68
DRIVEWAYS 68
FIRE HYDRANTS 70
FLAG POLE HOLDERS/FLOWER BASKETS 70
FLOWER POTS/ASHTRAYS 70
LIGHTING TYPE AND SPACING 71
OUTDOOR DINING 71
PARKING LANES 72
SIGN POSTS 72
TRAFFIC SIGNAL POLES AND TRAFFIC SIGNAL HEADS 72
TRANSIT AMENITIES 72
TRASH RECEPTACLE 73
TREES 73
UTILITIES 79
UTILITY COVER 79
UTILITY VAULTS 79

WHEN TRAFFIC CALMING IS NEEDED 80

It is important to note that these guidelines are intended to provide guidance and direction when designing streets and streetscapes. They should be flexible and sensitive to any unique or unusual situations accounting for the specific traffic, vehicle, and street conditions at any given location. Sound engineering and planning judgment should be used to produce designs in keeping with the context of the adjacent land uses and surrounding street network.

Creating "Great Streets"

In 2001, the City of Roanoke adopted *Vision 2001-2020*, a comprehensive plan with the overall goal of making Roanoke an attractive place for people of all ages, backgrounds, and income levels to live, work, shop and play. A strategic initiative of the plan is to improve the city's streetscapes.

Strategic Initiative

Improving Streetscapes

"Good street design supports multiple modes of transportation and adds value to the adjoining properties. It is essential to the continuing revitalization of downtown, neighborhoods, and commercial areas. A streetscape design manual will address the design of new and existing streets and will provide guidance for planning and implementing improvements to create "Great Streets." Roanoke's streetscapes should be welcoming and attractive multi-modal linkages that carry vehicle traffic, pedestrians, and bicycles safely and efficiently to and from their destinations. Recognizing the importance of creating an urban network of streets within the City, guidelines for street design will be based on a street classification system that balances the purpose of the roadway with the impacts on the surrounding areas.

Streets play an integral role in establishing the image of a community in that they affect the health, vitality, quality of life and economic welfare of a city. Great streets help facilitate healthier bodies and happier minds by creating attractive well-connected multimodal facilities. Simply put, Roanoke must be a beautiful city. The Comprehensive Plan identifies an action item (IN.A1) to help meet this goal:

"Adopt standard design principles for streets and develop a manual to guide construction that affects the streetscape and includes attractive designs for traffic calming devices."

The City of Roanoke is working to create great streets and has developed this street design manual that provides guidelines to meet this goal.

Roanoke is a mature city in which most of the land has been developed and an extensive street network exists. New streets will be created as new subdivisions are constructed. While characteristics of their streets are defined by the Subdivision Ordinance, these guidelines show the preferred appearance and configuration of the streetscape's elements. This manual will become most useful as projects arise that retrofit existing streets within their existing right-of-way.

Streets are the most widely used public spaces within the City. They have multiple uses and multiple users of various ages, abilities and disabilities. Each user has a different view on what makes a "great street" that depends on their purpose for using the street whether it is for commuting, recreation, shopping, working, socializing, etc. Street users include:

- Motorists
- Pedestrians
- Bicyclists
- Transit users
- Transit operators
- Delivery personnel
- Emergency vehicle operators
- Utility companies
- Users of the adjacent land uses including residents and businesses

The design challenge for great streets is to meet the needs and wants of the various users by finding the proper balance between the street's function and its appearance, given the character of its location.

THE MANY FACES OF STREET USERS

These Street Design Guidelines reflect the following goals:

- To serve a variety of users such as motorists, pedestrians young and old, transit riders, transit operators, bicyclists young and old, people using the adjacent land uses for living, working, shopping, etc.
- To provide accommodation for these users as appropriate, maximizing the number of transportation options available within the public right-of-way.
- To provide a safe, convenient and comfortable space for non-motorized street users to travel.
- To recommend street designs that encourage active living thus improving people's health, improving air quality, and reducing traffic congestion.

Streets set the framework for development by defining the land development pattern and how much development can be supported. The following design principles guided the development of the Street Design Guidelines to meet the goals.

- Pavement should be kept to the minimum width necessary.
- Pedestrian accommodation in the form of sidewalks or shared-use pathways should be provided along all arterial streets and all collector streets. Such accommodation should also be provided along all local streets in the following character districts: Downtown, Village Center, Traditional Neighborhood, Suburban Neighborhood, Local Commercial, Regional Commercial, and Industrial.
- Pedestrian accommodation should be separated from vehicle travel lanes by street trees and/or on-street parking.
- Bicycle accommodation should be considered along all arterial and collector streets. Bicycle accommodation on local streets should be provided within the travel lanes shared with motor vehicles and no additional markings or pavement should be provided unless a designated bicycle route requires the use of a local street.
- Where physical conditions warrant, trees should be planted whenever a street is newly constructed, reconstructed, or relocated.

Function and Character

In developing the Street Design Guidelines, City staff analyzed the City's street network and development patterns. The streets within the City have been classified as follows: Arterial, Collector, and Local. A street was determined to fall within one of these classes depending on the primary purpose of the street.

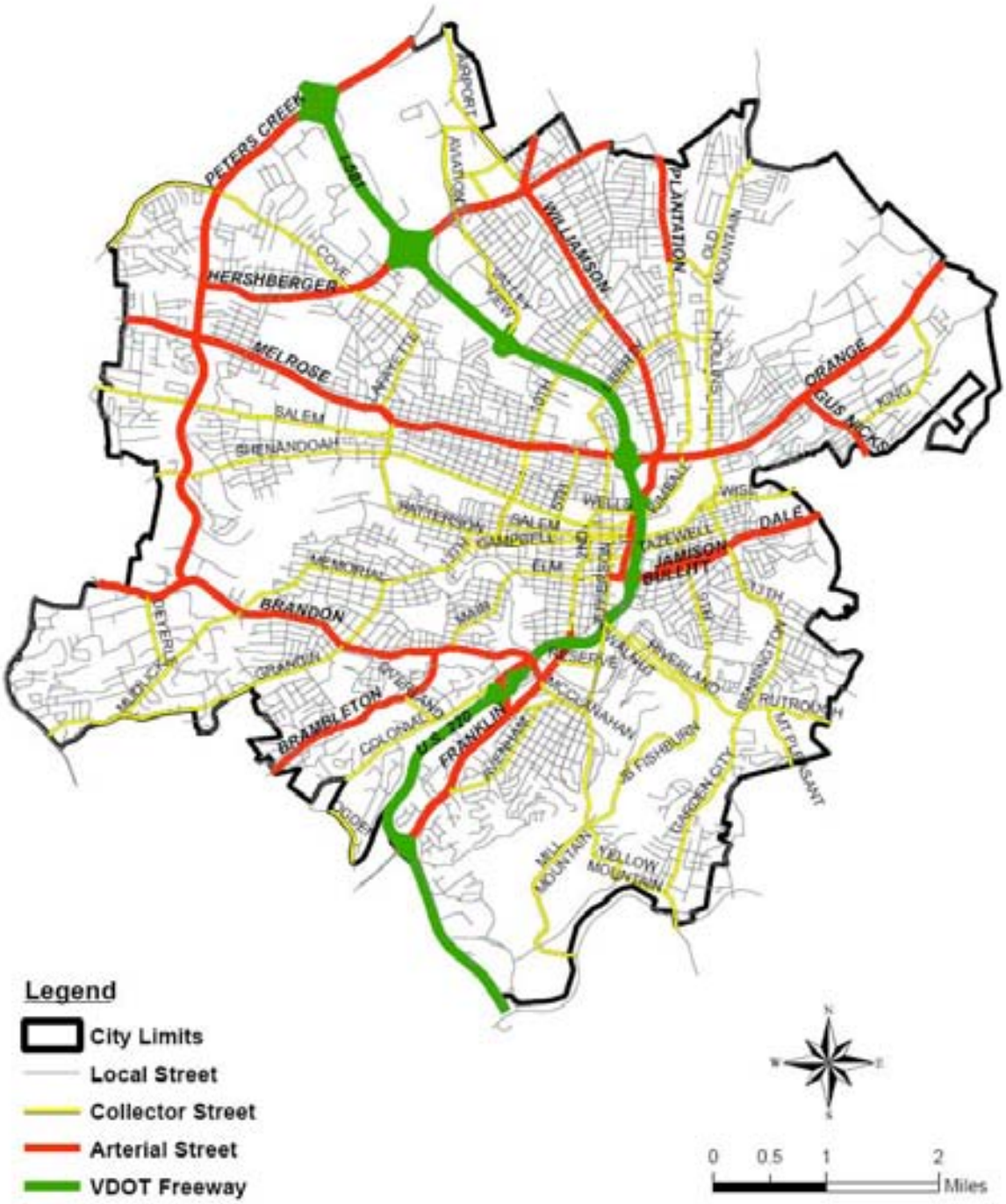
Arterials (ART) – Provide mobility or the ability to get from one place to another place by efficiently moving a large volume of people. Travel modes that provide mobility include walking, cycling, public transit, taxi, automobile, or other motorized vehicle. However, the majority of travel on this type of street is by motorized vehicles that are traveling longer distances at higher speeds. Driveways that provide access to adjacent parcels should be minimized along arterials.

Collectors (C) – Provide a combination of mobility, described above, and accessibility. Accessibility refers to the ability for people to reach desired goods, services, activities and destinations. In other words, half of the people using collectors are just passing through and the other half is accessing a destination served by that street. Vehicle speeds on collectors are typically between that of arterial and local streets. Driveways are more common along collectors than arterials.

Locals (L) – Provide accessibility to residences, businesses, and other destinations that provide goods, services, or activities. Local streets constitute the majority of streets in the City. Vehicle speeds on local streets are typically low.

This classification is different from the Virginia Department of Transportation (VDOT) functional street classification. The VDOT classification determines streets eligible for state funding whereas the Roanoke streets hierarchy will be used internally as a guide to the street's purpose and use. Note that I-581/U.S. 220 is classified as a VDOT Freeway and does not fall under the scope of these street design guidelines. The following map shows the distribution of the street hierarchy.

Roanoke's Street Hierarchy



Development patterns in the City of Roanoke can be described by one of the following eight character districts:

- Downtown (D)
- Village Center (V)
- Recreation/Open Space (ROS)
- Traditional Residential Neighborhood (TN)
- Suburban Residential Neighborhood (SB)
- Local Commercial (L-COM)
- Regional Commercial (R-COM)
- Industrial (IND)

The character districts provide a general perspective to how land developed over time by grouping land uses according to building style, development form, and land purpose. Character district definitions largely follow those given in the *Vision 2001-2020* Comprehensive Plan. In some cases, character districts described in *Vision 2001-2020* have been combined for the Streetscape Design Guidelines, due to their similar street characteristics.

1. Downtown

Downtown is characterized by a pronounced skyline, pedestrian friendly streets and a mixture of retail, office, residential, and light industrial uses. Downtown streets form an interconnected grid and are designed to accommodate both vehicular and pedestrian use. Buildings are typically set close to the street and often adjoin each other. On-street parking is common and off-street parking is generally concentrated in parking structures or is located to the side or rear of buildings.

Campbell Avenue, Downtown Roanoke

2. Village Center

Roanoke's traditional neighborhoods typically feature small commercial centers that allow residents to live, work, and shop in a local setting. Village centers are characterized by a mixture of high-density uses, including neighborhood-oriented retail, office, and residential uses. Buildings are typically set close to the street and often adjoin each other. On-street parking is common and off-street parking is located to the side or rear of principal buildings.

Grandin Village

3. Recreation/Open Space

The recreation and open space district is intended to recognize and enhance active park and recreation lands, passive open spaces, and significant natural and scenic features by encouraging these areas to protect unique land resources from degradation. It is further intended to prevent the encroachment of incompatible land uses, while permitting limited construction within open space areas which is supportive of their function and which promotes their use and enjoyment.

JB Fishburn Parkway, SE

4. Traditional Neighborhood

Traditional neighborhoods are characterized by small-medium sized lots (from a few thousand square feet to a quarter acre); one and a half- or two-story houses often with porches; consistent building setbacks; and an interconnected grid of narrow, sidewalk and tree-lined streets often including alleys. These neighborhoods developed between the 1890s and 1940s adjacent to downtown and as the streetcar system expanded outward. Traditional neighborhoods often feature churches, neighborhood schools, and small neighborhood commercial centers. Traffic volumes and speeds are typically low and on-street parking is common.

Berkley Avenue, SW

5. Suburban Neighborhood

Suburban neighborhoods are characterized by large lots (greater than 7,000 square feet), a variety of housing sizes and styles, deep front yard setbacks, wide curvilinear streets, and prominent driveways and garages. These neighborhoods developed after World War II as dependency on the automobile increased. Off-street parking in driveways is typical, and sidewalks are frequently absent.

Showalter Road, NW

6. Local Commercial

Local commercial centers and corridors are included in this character district. Local commercial centers are intended to serve multiple neighborhoods but generally do not draw customers from a citywide or regional base. These centers are typically located along arterial or

collector streets and are characterized by large sites, linear development, deep setbacks, and large expanses of parking. Uses often include grocery stores, restaurants, and small retail shops.

Williamson Road, NE

Local commercial corridors are intended to serve as retail strips for customers throughout the City and are generally located on arterial streets. They are characterized by linear development on wide streets with frequent curb cuts but without bicycle lanes or pedestrian traffic access. Land uses often consist of a variety of business supportive services such as banks, restaurants, furniture stores, and convenience stores, among others.

7. Regional Commercial

Regional commercial centers are intended to serve as retail centers that draw customers from the City and the region. These centers are typically located along arterial streets or interstate highways that do not feature on-street parking. They are characterized by large sites with deep setbacks and large expanses of parking that usually lack pedestrian facilities and landscaping. Land uses often include big-box retail stores, shopping malls, national chain restaurants, and entertainment attractions.

Crossroads Shopping Center

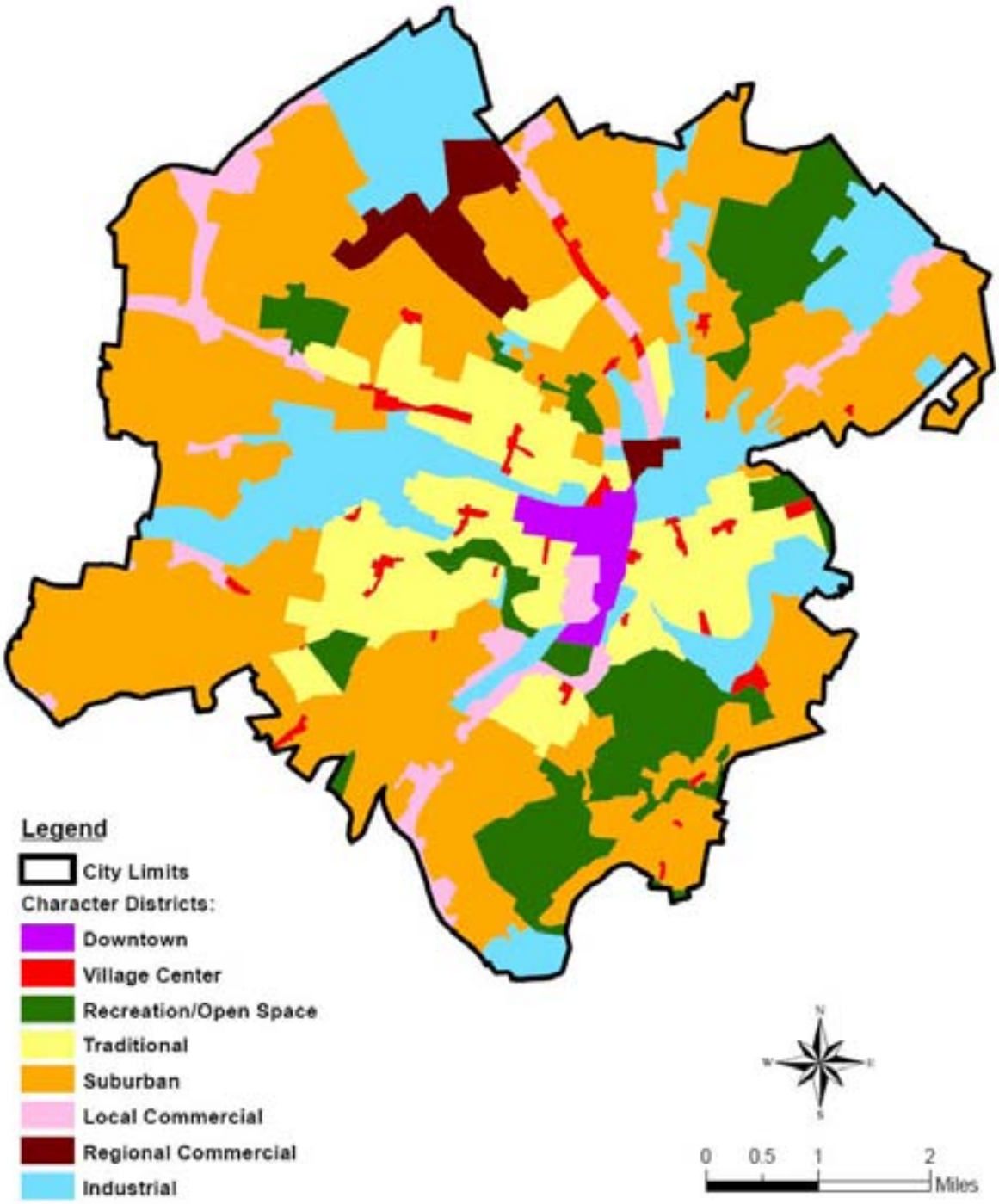
8. Industrial

Shenandoah Avenue, NW

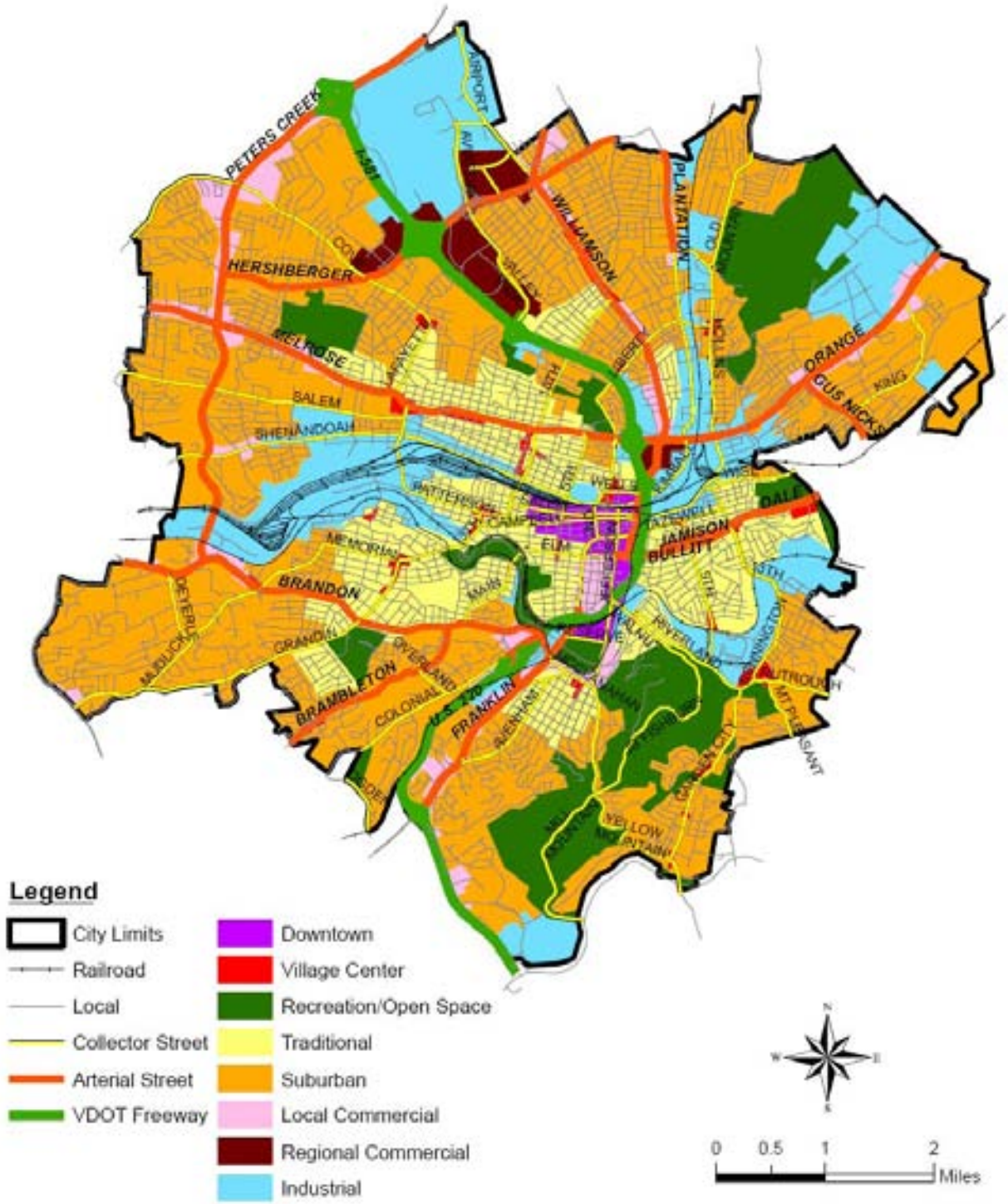
Industrial centers and corridors are intended to serve as employment hubs that attract workers from the City and the region. These centers are typically located along arterial streets, interstate highways, railroads, or rivers. They are characterized by large sites with perimeter fencing, outdoor storage, deep setbacks, large expanses of parking, and a principal entrance. They usually lack pedestrian facilities and landscaping or streetscapes.

The character districts are listed above in a hierarchical order. When there is a street that passes between two character districts and it is not clearly shown to be included in one or the other, the ranking above should dictate the character district order in which the street should follow the guidelines. The following map shows the distribution of these character districts.

Roanoke's Character Districts

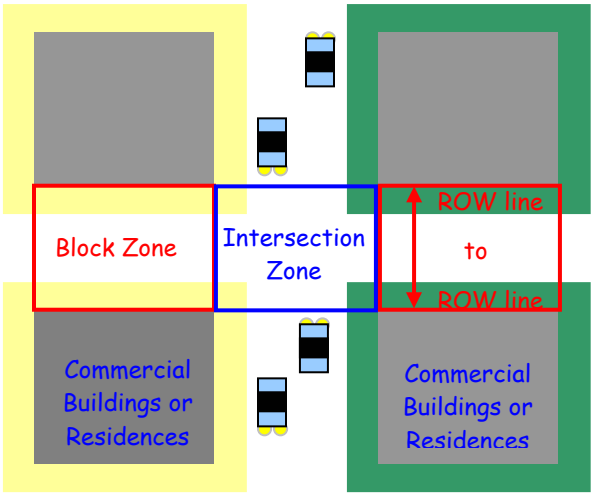


Street Hierarchy and Character Districts



Character District Design Guidelines

After classifying the streets and defining the character districts, staff identified elements of a streetscape as they relate to automobile accommodations, bicycle accommodations, pedestrian accommodations, transit accommodations, trees, signs, and lighting. These elements may fall within the block zone or the intersection zone of a street.



Key areas within the intersection zone include the curb and gutter, drainage, pedestrian areas, curb ramp, crosswalks, utilities, and the vehicle travel area. Typically, a 6-inch curb and 2-foot gutter pan separates the vehicle and pedestrian areas. Pedestrian areas include the sidewalk corners and the crosswalks.

Most of this manual focuses on the block zone while the intersection zone elements are discussed primarily in the general streetscape elements section.

Streetscape elements within the block zone of the public right-of-way may fall within one of seven possible block zones. The sum of the widths needed for each of the block zones make up the total right-of-way width of a street.

Zone 1: Travel An area for motor vehicle travel that may be shared with bicycles. Travel lanes should be kept to the minimum number necessary to ensure good overall function. Providing excessive number of lanes encourages speeding and increases pedestrian crossing distances. The minimum travel lane width necessary should be used with 11 feet being the most common.

Zone 2: Parking A 7-foot wide space for motor vehicles to park on-street typically between the curb face or edge of pavement and the travel lane(s). On streets that require a gutter pan, the parking zone will include the typical 2-foot gutter within the 7-foot zone. Unmarked spaces are preferred to marked spaces because they provide more parking spaces within a block of a given length.

Zone 3: Gutter/ Drainage Depending on the typical section of the street, storm water drainage may use a gutter pan or a grass area.

Zone 4: Curb Space for 6-inch wide curbs.

Zone 5: Planter/ Utilities The planter/utilities zone may also be considered a snow accumulation zone or a splash zone. It may be a grass or paved (e.g. concrete) area and is most commonly used for signs and above-ground utilities such as lights, utility cabinets, and fire hydrants. It is also the appropriate location for planting trees or other landscaping and for street furniture such as benches, transit shelters, trash cans, and information kiosks. Such items should be placed in a minimum 4-foot side strip (6 feet is required for new streets). They should not extend into the pedestrian zone as they would reduce the amount of travel space for disabled pedestrians and create obstacles. The *General Streetscape Elements* section provides additional guidance on the appropriate tree species to plant per planting strip width.

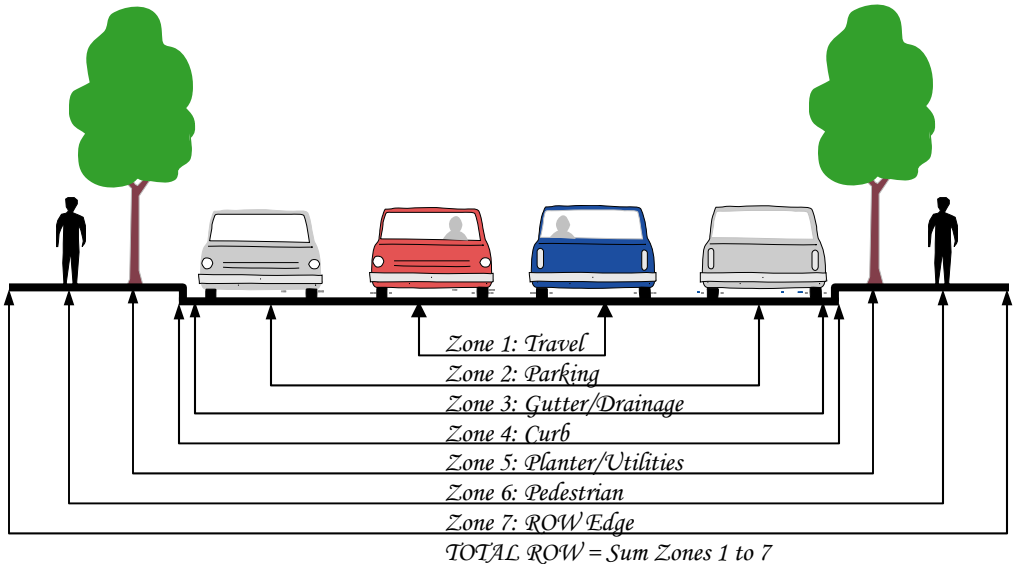
Existing streets may not always have sufficient right-of-way space to allow for a planter zone but where excess right-of-way width exists, streets with pedestrian accommodation should provide a minimum 4-foot planter/utilities zone with the preferred width of 6 feet as required for new streets.

Zone 6: Pedestrian This zone provides a safe and comfortable travel space for pedestrians and other non-motorized users. Pedestrian accommodation may be provided in the form of sidewalks or shared-use paths. Wherever possible, pedestrian accommodations should be

buffered from vehicular traffic through the use of a planter zone, parking zone or on-street bicycle accommodation. In the downtown or village center character districts, this zone includes the frontage space needed for opening doors.

Occasionally, the recommended typical sections list 8 feet for a pedestrian zone (4 feet of sidewalk on either side of the street). Where ROW allows, this should be increased to a minimum of 10 feet, 5 feet on either side. Where 4-foot sidewalks are used, there should be paved refuge areas every 200 feet to provide sufficient space for wheelchair users to pass each other as required by the Americans with Disabilities Act.

Zone 7: ROW Edge A buffer between the private property line and the closest built component of the public right-of-way. This 6-inch grass strip ensures that construction does not extend over the property line.



The majority of the typical sections that follow show <u>retrofit</u> options that answer the question, "I only have XX feet of right-of-way; what does the City think the street should look like?" Several typical sections are also provided that show options for <u>preferred</u> multimodal street designs. All streets have the opportunity to accommodate multiple modes of transportation as determined by the City's transportation planning and engineering staff. Adding bicycle accommodations to any street should follow the guidance provided under *General Streetscape Elements Guidelines*.

Below are examples for interpreting notation on the typical sections shown on the following pages.

CSB (2b) = collector in a suburban neighborhood with 2 lanes, second option

Collector
Suburban Neighborhood
2-lane, second option

LCDV (2c) = local or a collector in downtown or a village center with 2 lanes, third option

Local or Collector
Downtown or Village Center
2-lane, third option

ART 6 = arterial street with 6 lanes

Arterial
6-lane option

Note that in the tables that follow, the width of the zones listed show the total width, including both sides of the street. Typically, except for the number of lanes and their widths, these values should be divided by two to determine the width of the zone on each side of the street.

Arterials

The following typical sections show recommendations for arterial streets within the City. The previous maps show the City's arterials in red.

Arterials are the only street class where broad recommendations are provided for all character districts. The following discussions on character districts pertain to collector and local streets. However, arterials within downtown or arterials that serve as the principal street of a village center should follow the decorative element recommendations of that section. Grass planting strips do not apply to these districts since the planter/utilities strip is concrete with trees in tree grates and wider pedestrian zones.

Providing the appropriate bicycle accommodation along arterials considers the following issues:

- Motor vehicle travel speeds
- The size of intersections that will be traversed
- If the cyclist will be crossing interstate on- or off-ramps

All arterials at the point of connection with VDOT freeway ramps should use off-street, shared-use paths on both sides to provide cyclist refuge areas that separate the cyclist from merging motor vehicles. Arterials with 6 lanes or more should provide shared-use paths on one or both sides of the street instead of on-street accommodation. Arterials with fewer than 6 lanes may accommodate bicycles on- or off-street depending on site design options. However, arterials that traverse either traditional or suburban neighborhoods or village centers, in addition to on-street accommodation, should consider a shared-use path instead of a sidewalk on one or both sides of the street to provide young cyclists a comfortable riding space.

Lighting along arterials should be provided by underground wiring on non-wood poles. Arterials within downtown or village centers should feature pedestrian-scale lighting that also serves to light the vehicle travel way; overhead decorative lighting should only be used at intersections. The effective curb return radii for arterial street intersections may range from 35 feet to 50 feet. The following is a table of arterial typical section options.

Preferred Multimodal Options

	ARTERIAL STREETS	**ART (2a)**	**ART (4a)**	**ART (6a)**
1.	Travel Zone	28	50	66
2.	Parking Zone	0	0	0
3.	Gutter/Drainage Zone	4	4	4
4.	Curb Zone	1	2	2
5.	Planter/Utilities Zone	14	31	31
6.	Pedestrian Zone	15	15	20
7.	ROW Edge	3	3	5
	TOTAL ROW =	**65**	**105**	**128**

Retrofit Options

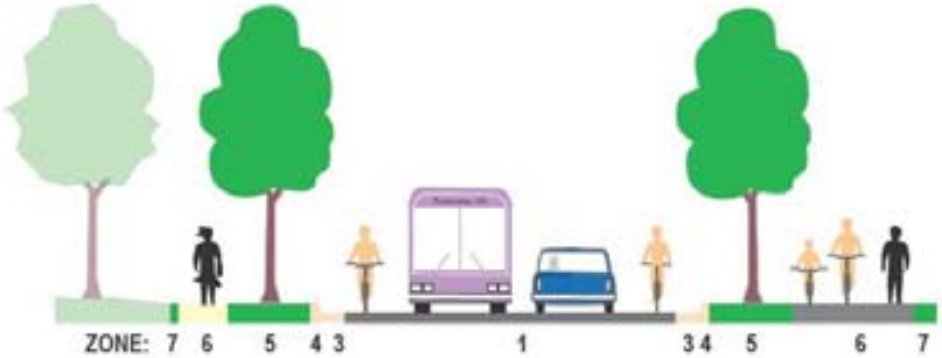
	ARTERIAL STREETS	**ART (2b)**	**ART (3)**	**ART (4b)**
1.	Travel Zone	22	32	42
2.	Parking Zone	0	0	0
3.	Gutter/Drainage Zone	4	4	4
4.	Curb Zone	1	1	1
5.	Planter/Utilities Zone	14	14	14
6.	Pedestrian Zone	8	8	8
7.	ROW Edge	1	1	1
	TOTAL ROW =	**50**	**60**	**70**

Retrofit Options

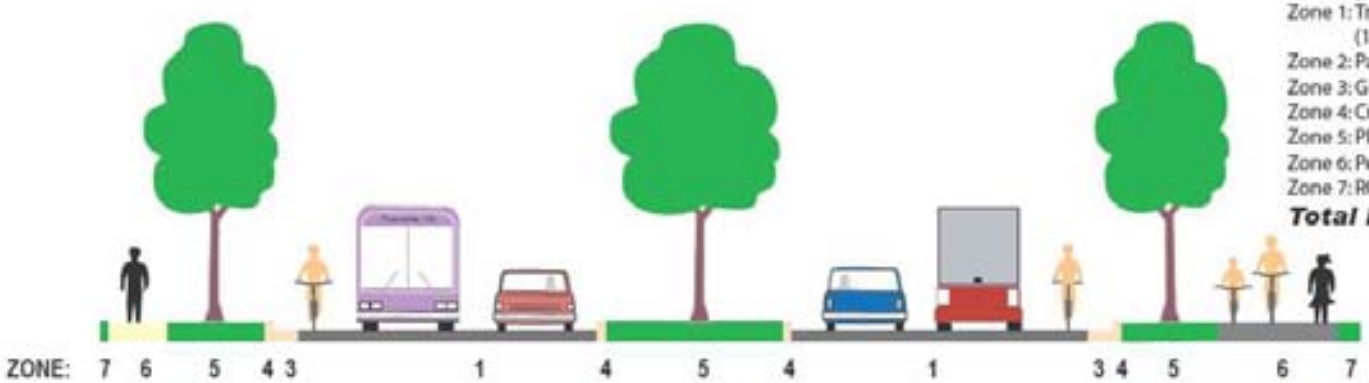
	ARTERIAL STREETS	**ART (4c)**	**ART (6b)**	**ART (6c)**
1.	Travel Zone	44	66	60
2.	Parking Zone	0	0	14
3.	Gutter/Drainage Zone	4	4	4
4.	Curb Zone	2	2	3
5.	Planter/Utilities Zone	19	29	42
6.	Pedestrian Zone	10	8	10
7.	ROW Edge	1	1	1
	TOTAL ROW =	**80**	**110**	**134**

Drawings accompanying these tables are on the following pages.

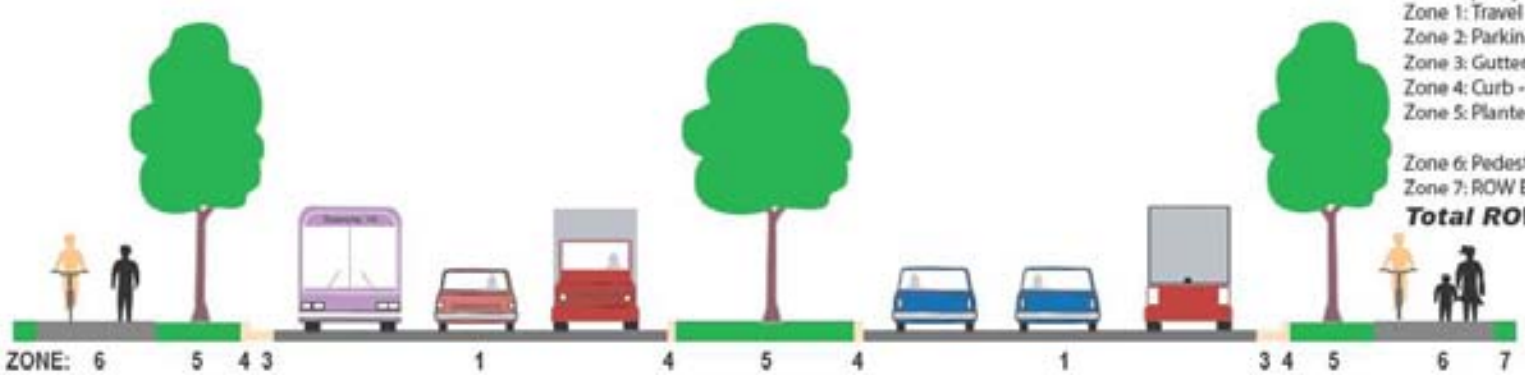
Preferred Multimodal Options for Arterial Streets



ART (2a)
Zone 1: Travel - 28' (11' lanes w/striped bike lanes)
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 15' (5'/10')
Zone 7: ROW Edge - 3' (6"/2'-6")
Total ROW: 65'

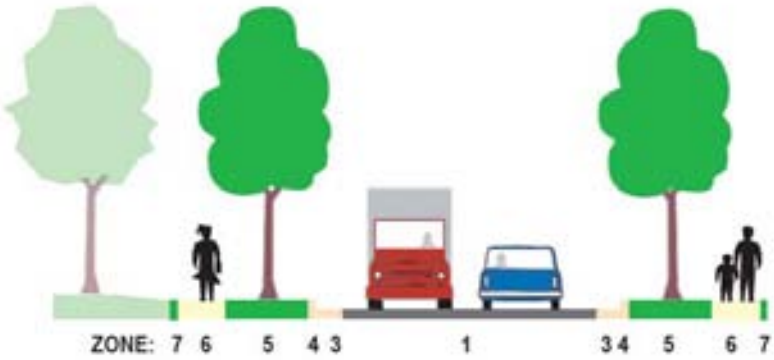


ART (4a)
Zone 1: Travel - 50'
(11' lanes w/striped bike lanes)
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 31' (8'/15'/8')
Zone 6: Pedestrian - 15' (5'/10')
Zone 7: ROW Edge - 3' (6"/2'-6")
Total ROW: 105'

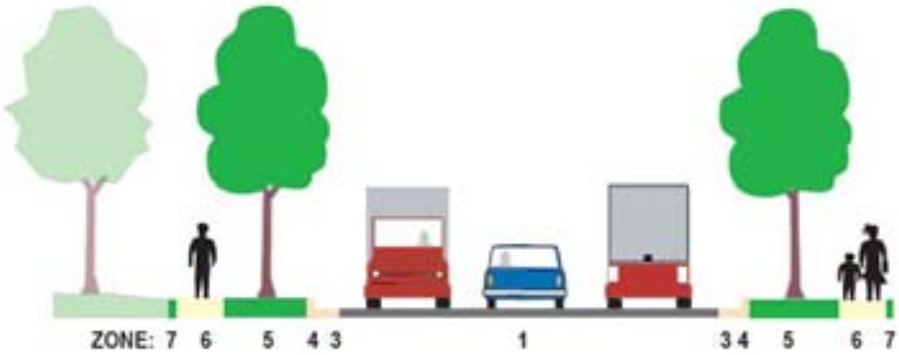


ART (6a)
Zone 1: Travel - 66'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 31'
(8'/15'/8')
Zone 6: Pedestrian - 20'
Zone 7: ROW Edge - 5'
Total ROW: 128'

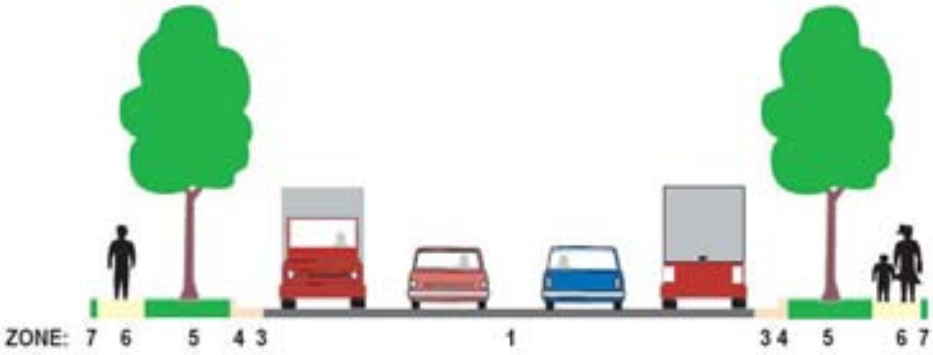
Retrofit Options for Arterial Streets



ART (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 8'
Zone 7: ROW Edge - 1'
Total ROW: 50'

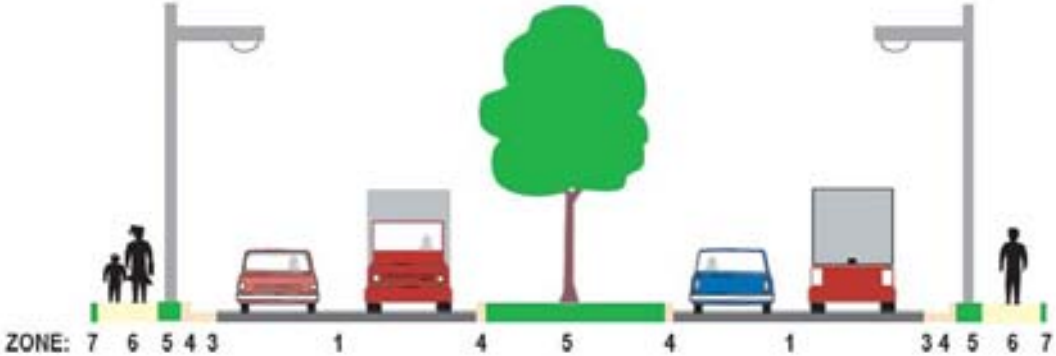


ART (3)
Zone 1: Travel - 32'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 8'
Zone 7: ROW Edge - 1'
Total ROW: 60'

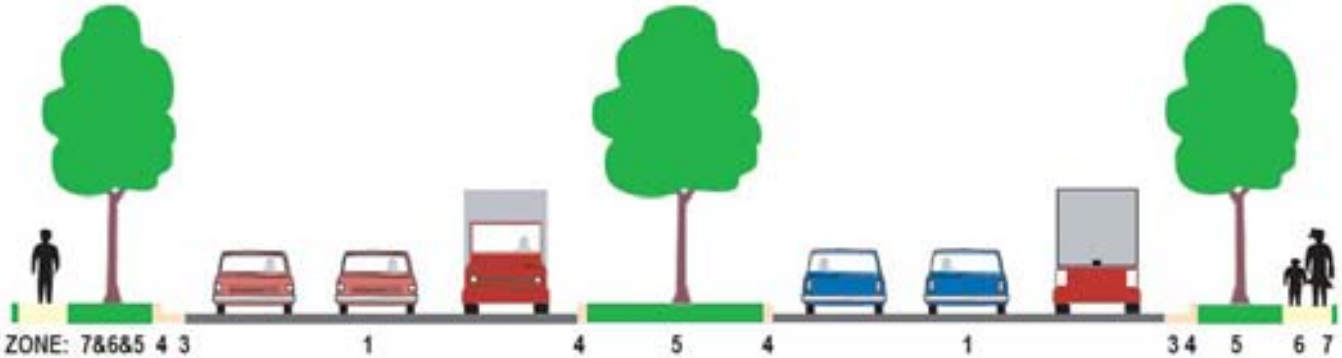


ART (4b)
Zone 1: Travel - 42'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 8'
Zone 7: ROW Edge - 1'
Total ROW: 70'

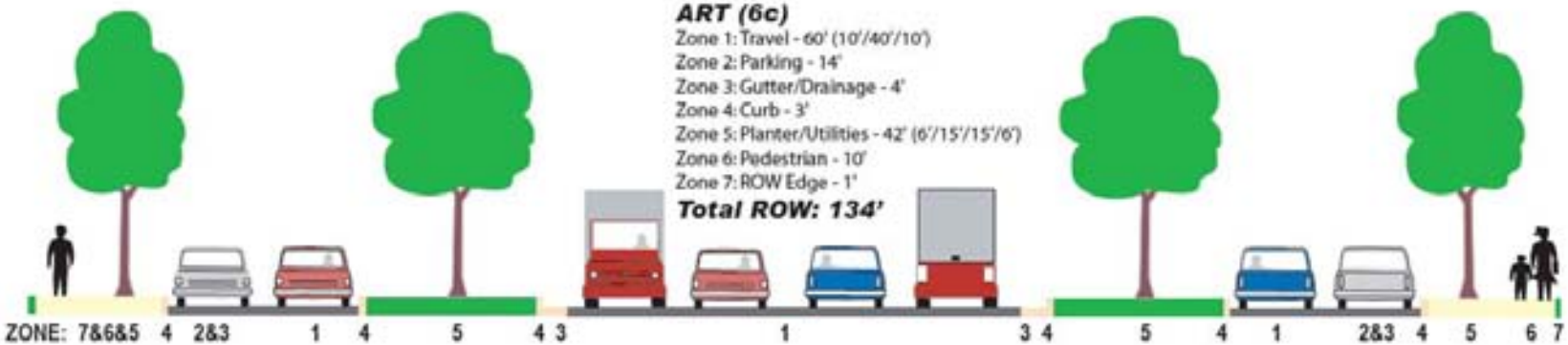
Retrofit Options for Arterial Streets



ART (4c)
Zone 1: Travel - 44'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 19' (2'/15'/2')
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 80'



ART (6b)
Zone 1: Travel - 66'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 29' (7'/15'/7')
Zone 6: Pedestrian - 8'
Zone 7: ROW Edge - 1'
Total ROW: 110'



ART (6c)
Zone 1: Travel - 60' (10'/40'/10')
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 3'
Zone 5: Planter/Utilities - 42' (6'/15'/15'/6')
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 134'

Downtown

The streets included in the downtown character district are shown on the following map. The elements described below should be applied to the block zones of downtown streets. This generally excludes the intersection zone area of the sidewalk that extends beyond the edge of a building or back of the sidewalk leading to the intersection.

Block Elements:

Benches	Black powder-coated backless 4-6 feet wide, such as those made by *Twist and Turns* located in the Market area.
Brick Edging	A continuous strip along the back of the curb, 2 bricks wide extending 16 inches from the curb, also around tree grates and lampposts only.
Flagpole Holders	One flagpole holder per decorative lamppost may be considered on arterial or collector streets where flags are periodically planned as part of the streetscape.
Flower Baskets	Two flower baskets should be placed on all decorative lampposts along downtown arterials and collectors. Flower baskets are optional on downtown local streets.
Lamppost/Light Fixture	Decorative acorn such as the *Holophane* Washington PostLite luminaire, color grey RAL 7010 powder-coated, placed 8 inches from the curb, at the back edge of the first brick.
Trash Cans	Decorative, such as the *Victor Stanley*, powder-coated grey RAL 7010 with the City logo like those by *Twist & Turns* color "verde". The logo should face the pedestrian zone.
Tree Grate	Cast iron with the flag emblem on each corner.

Elements such as benches, trash cans, and fire hydrants should be placed at the edge of the 16-inch brickwork and not within it. However, elements such as sign posts for guiding traffic or parking may be placed in the center of the brick edging.

The following are guidelines for downtown elements found within the intersection zone of a street.

Intersection Elements:

Lighting Type	Decorative cobra on a shared pole with traffic signals.
Crosswalk	Decorative 10-foot wide crosswalks at all signalized intersections featuring pavement distinctions through color and texture.
Effective Curb Return Radius	20 feet (local street intersections) 25 feet (collector street intersections)
Traffic Signal Poles	Galvanized
Traffic Signal Heads	Black
Street Name Signs	a) Overhead MUTCD green signs on traffic mast arms at signalized intersections with the star symbol. b) Pedestrian-scale decorative signs mounted on black poles at all intersections within the Historic District. c) Pedestrian-scale MUTCD green signs mounted on black poles at all downtown intersections outside the Historic District.

Pictures showing the elements discussed above are included in the *General Streetscape Elements* section. Utility lines or wires in the downtown character district should be located underground.

Downtown Character District

Legend

- City Limits
- Downtown
- Local Street
- Collector Street
- Arterial Street
- VDOT Freeway

N
W E
S

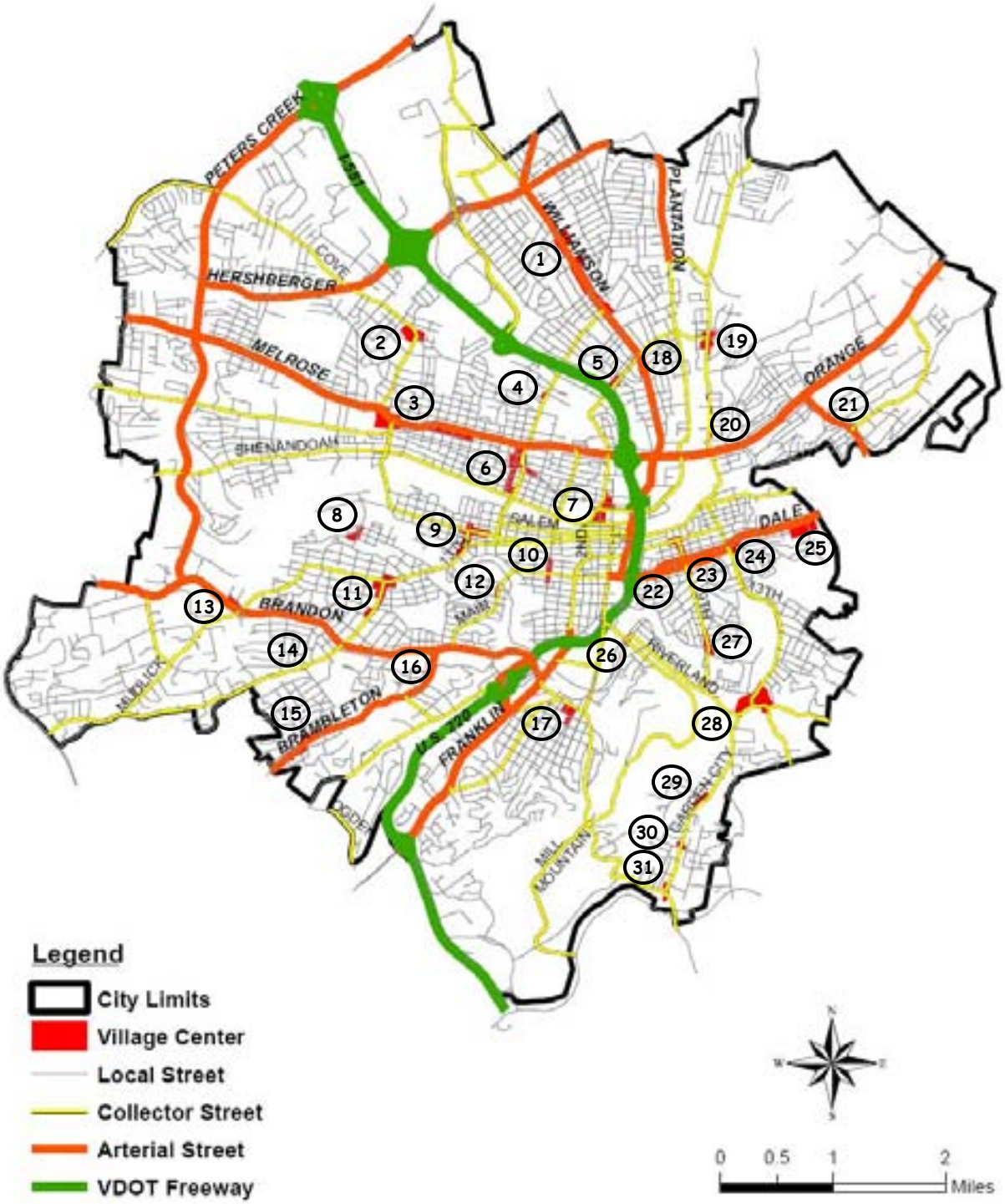
0 0.1 0.2
Miles

Village Center

Thirty-one village centers have been identified through neighborhood plans and more detailed delineation of them are located in their respective plan. The village center's general locations are listed below and shown by number on the village center character district map.

1. Williamson Rd. from Preston Ave. to Wildhurst Ave., NW
2. Lafayette Blvd. @ Cove Rd., NW
3. Orange/Melrose Ave. from 16th St. to Forest Park Blvd., NW
4. 10th St. @ Andrews Rd., NW
5. Liberty Rd. @ Courtland Rd., NW
6. 11th St. from Centre Ave. to Orange Ave., NW
7. Wells Ave. @ 1st St., NW
8. Bridge St. @ Roanoke Ave., SW
9. 13th St. @ Patterson Ave., SW
10. 5th St. @ Elm Ave., SW
11. Grandin Rd. @ Memorial Ave., SW
12. Main St. @ Wasena Ave., SW
13. Brandon Rd. @ Edgewood St., SW
14. Grandin Rd. @ Guilford Ave., SW
15. Brambleton Ave. @ Corbieshaw Rd., SW
16. Brambleton Ave. @ Brandon Rd., SW
17. Crystal Spring Ave. @ 22nd St., SW
18. Williamson Rd. from Liberty Rd. to Laconia Ave., NE
19. Hollins Rd. @ Liberty Rd., NE
20. Hollins Rd. @ Georgia Ave., NE
21. Gus Nicks Blvd. @ King St., NE
22. Elm Ave. @ 5th St., SE
23. Tazewell Ave. @ 9th St., SE
24. Dale Ave. @ 13th St., SE
25. Dale Ave. @ Vernon St., SE
26. Walnut Ave. @ Piedmont St., SE
27. 9th St. from Woodrow Ave. to Buena Vista Blvd., SE
28. Bennington St. @ Riverland Rd., SE
29. Garden City Blvd. @ Hartsook Blvd., SE
30. Garden City Blvd. @ Mabry Ave., SE
31. Garden City Blvd. @ Yellow Mountain Rd., SE

Village Center
Character District



Benches, trash cans and tree grates should have decorative styles in village centers. Lighting along the blocks should be decorative and pedestrian scale. The public and streetscape designers may choose the decorative styles of these elements and whether or not to incorporate flower baskets or flag pole holders on the decorative lampposts. Overhead utilities crossing the "main" street(s) of the village center should be placed underground. Overhead utilities that parallel the "main" street(s) may be placed underground where reasonable and feasible.

The colors for these streetscape elements are also flexible according to the village design and public input. There should however be a color scheme to which these elements are coordinated.

Intersection Elements:

Lighting Type	Decorative on a shared pole with the traffic signals.
Crosswalk	The principal street(s) of the village center should provide decorative 10-foot wide crosswalks featuring pavement distinctions through color and texture.
Effective Curb Return Radius	20 feet (local street intersections) 25 feet (collector street intersections)
Traffic Signal Poles	Painted according to the determined color scheme. Black and dark green are common options.
Traffic Signal Heads	Black
Street Name Signs	a) Overhead MUTCD green signs on traffic mast arms at signalized intersections. b) Pedestrian-scale decorative signs at all intersections.

The following tables show the local and collector street options for downtown and village centers.

DOWNTOWN

	MULTIMODAL STREETS	**DV (2a)**	**DV (2b)**
1.	Travel Zone	28	30
2.	Parking Zone	14	7
3.	Gutter/Drainage Zone	0	2
4.	Curb Zone	1	1
5.	Planter/Utilities Zone	10	8
6.	Pedestrian Zone	30	12
7.	ROW Edge	0	0
	TOTAL ROW =	**83**	**60**

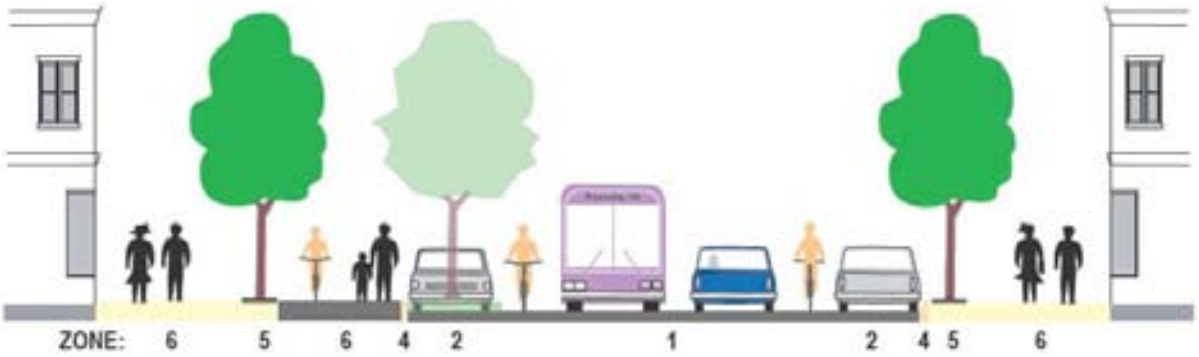
	LOCAL STREETS	**L-Woonerf**	**LDV one-way (1 or 2 lanes)**	
1.	Travel Zone	undefined	10	20
2.	Parking Zone	undefined	13	13
3.	Gutter/Drainage Zone	undefined	0	0
4.	Curb Zone	none	1	1
5.	Planter/Utilities Zone	undefined	6	6
6.	Pedestrian Zone	undefined	10	10
7.	ROW Edge	none	0	0
	TOTAL ROW =	**25**	**40**	**50**

	LOCAL or COLLECTOR STREETS	**LCDV (2c)**	**LCDV (2d)**	**LCDV (2e)**	**CDV (4)**
1.	Travel Zone	20	20	22	38
2.	Parking Zone	0	7	14	0
3.	Gutter/Drainage Zone	2	2	0	4
4.	Curb Zone	1	1	1	1
5.	Planter/Utilities Zone	7	8	8	6
6.	Pedestrian Zone	10	12	15	11
7.	ROW Edge	0	0	0	0
	TOTAL ROW =	**40**	**50**	**60**	**60**

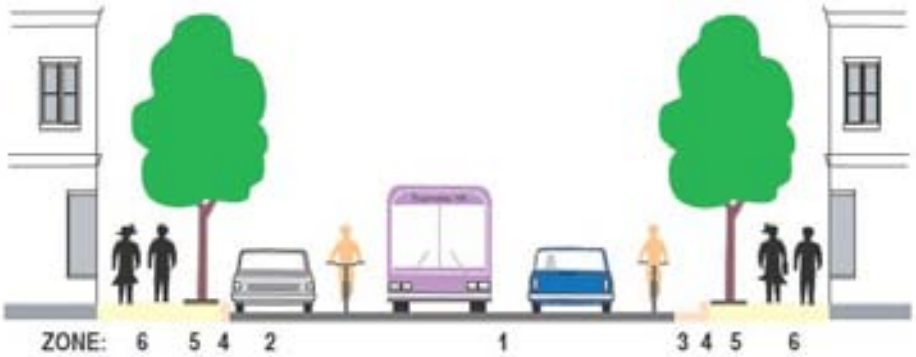
Typical section DV (2a) shows a multimodal street with 14-foot shared motor vehicle/bicycle lanes and a shared-use path for walking/bicycling recreation. Parking lanes are defined by bulbouts that provide additional planter space. Typical section DV (2b) shows an option with marked bicycles lanes without a shared-use path. The scenarios are appropriate for collector streets in downtown or "main streets" in village centers, which could be a local or collector street.

Preferred Multimodal Options for

Downtown Character District Collector Streets
Village Center Character District "Main Streets"



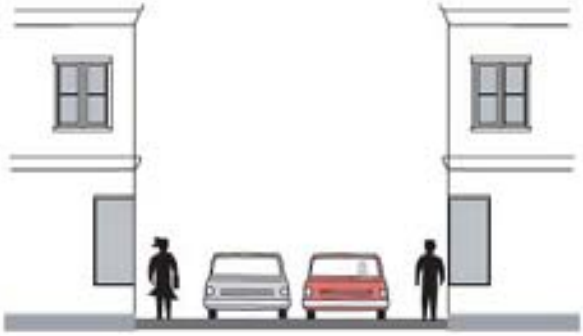
DV (2a)
Zone 1: Travel - 28' (2-14' shared-lanes)
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Aone 4: Curb - 1'
Zone 5: Planter/Utilities - 10'
Zone 6: Pedestrian - 30'
Zone 7: ROW Edge - 0'
Total ROW: 83'



DV (2b)
Zone 1: Travel - 30' (5'/11'/11'/3') striped bicycle lanes
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 12'
Zone 7: ROW Edge - 0'
Total ROW: 60'

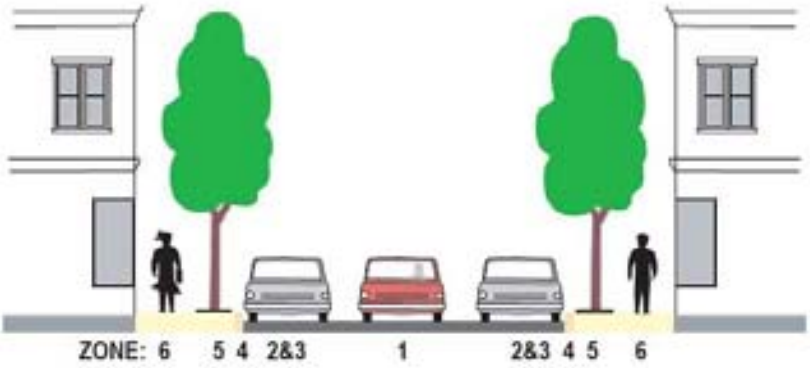
Retrofit Options for

Downtown and Village Center Character Districts
Local and Collector Streets

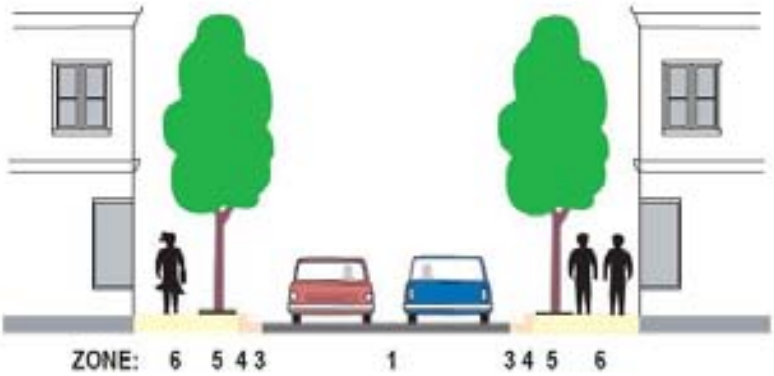


L-Woonerf
In this narrow shared-space, zones are not defined; automobile traffic is often one-way.

Total ROW: 25'

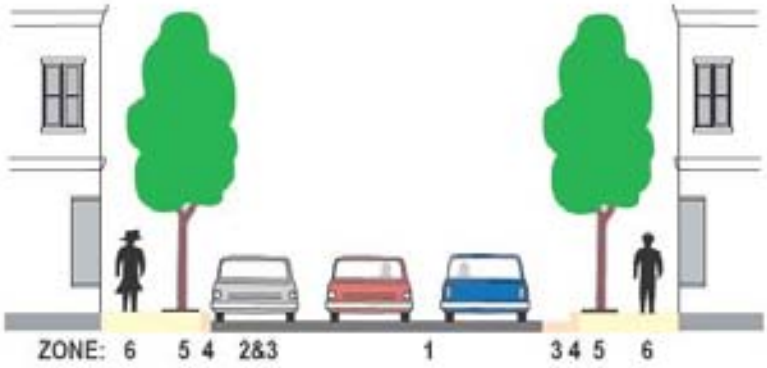


LDV-one-way
(1 or 2 lanes)
Zone 1: Travel - 10' or 20'
Zone 2: Parking - 13'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 6'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 0'
Total ROW: 40' or 50'

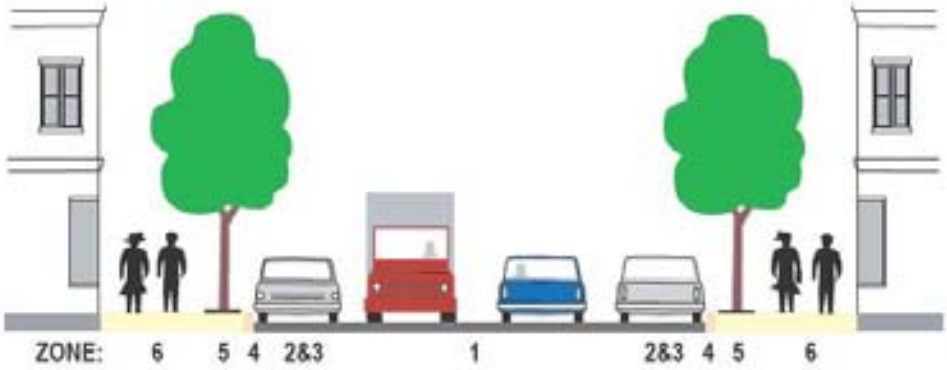


LCDV (2c)
Zone 1: Travel - 20'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 7'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 0'
Total ROW: 40'

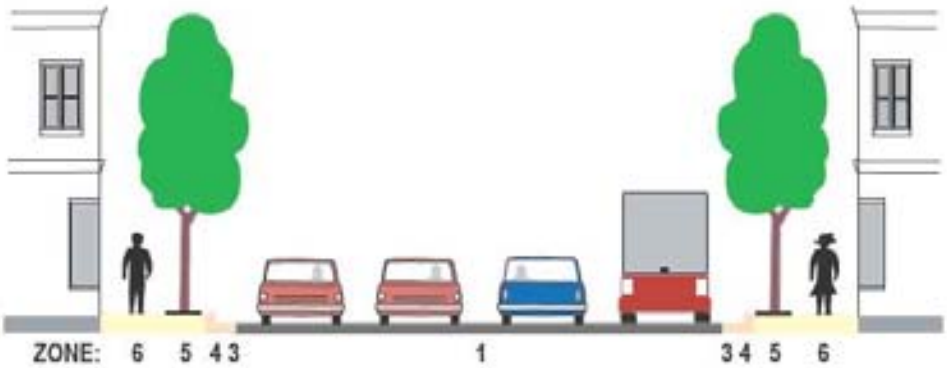
Retrofit Options for
Downtown and Village Center Character Districts
Local and Collector Streets



LCDV (2d)
Zone 1: Travel - 20'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 12'
Zone 7: ROW Edge - 0'
Total ROW: 50'



LCDV (2e)
Zone 1: Travel - 22'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Aone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 15'
Zone 7: ROW Edge - 0'
Total ROW: 60'



CDV (4)
Zone 1: Travel - 38'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Aone 4: Curb - 1'
Zone 5: Planter/Utilities - 6'
Zone 6: Pedestrian - 11'
Zone 7: ROW Edge - 0'
Total ROW: 60'

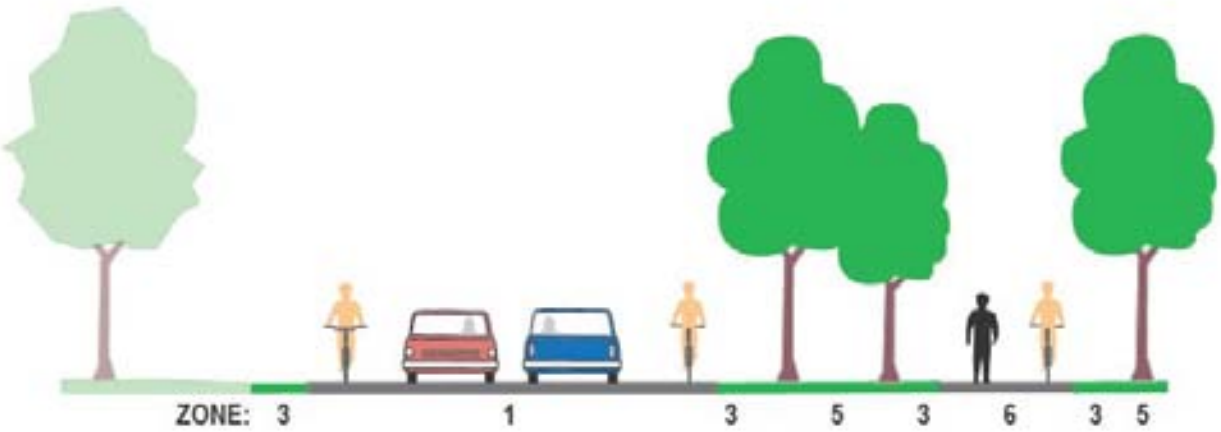
Recreation/Open Space

The following guidelines represent the minimum space recommended for local or collector streets through the Recreation/Open Space (ROS) district. Few streets actually traverse these areas as shown on the map of the ROS district on the next page. The provision of curbs, on-street parking, planter zones, and sidewalks should follow any appropriate park master plan and should be coordinated with the City's Park Planner. The effective curb return radius should be 20 feet for local street intersections and 25 feet for collector street intersections. Standard overhead lighting should be provided along all public streets in the ROS character district.

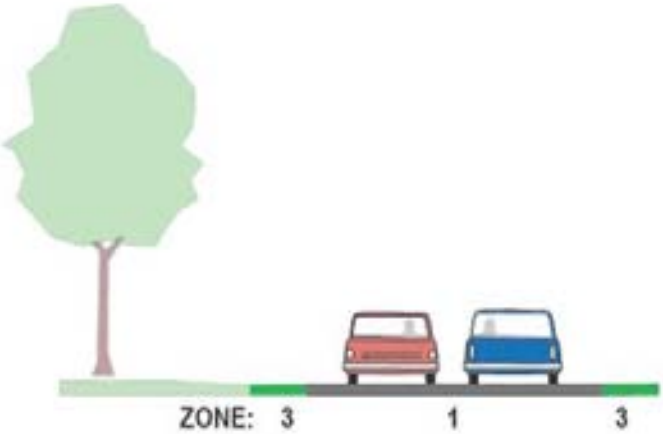
	LOCAL OR COLLECTOR STREET	**LCROS (2a)**	**LCROS (2b)**
1.	Travel Zone	30	22
2.	Parking Zone	0	0
3.	Gutter/Drainage Zone	12	8
4.	Curb Zone	0	0
5.	Planter/Utilities Zone	15	0
6.	Pedestrian Zone	10	0
7.	ROW Edge	0	0
	TOTAL ROW =	**67**	**30**

Typical section 2a shows an example of a local or collector street with full bicycle and pedestrian accommodations, a preferred multimodal scenario. The section includes 4-foot on-street bicycle shoulders and a shared-use path 10 feet wide. Typical section 2b shows the minimum accommodation for motor vehicles on a local or collector street.

Preferred Multimodal and Retrofit Options for Recreation/Open Space Character District Local and Collector Streets



LCROS (2a)
Zone 1: Travel - 30'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 12' (4'/4'/2'/2')
Zone 4: Curb - 0'
Zone 5: Planter/Utilities - 15' (10'/5')
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 0'
Total ROW: 67'



LCROS (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 8'
Zone 4: Curb - 0'
Zone 5: Planter/Utilities - 0'
Zone 6: Pedestrian - 0'
Zone 7: ROW Edge - 0'
Total ROW: 30'

Recreation/Open Space Character District

Traditional Neighborhood

Due to their grid street pattern and their proximity to the central business district, traditional neighborhoods are naturally multimodal offering automobile, bus and pedestrian accommodation. All collector streets should offer bicycle accommodation. Traditional neighborhoods commonly feature sidewalks for pedestrian accommodation. These guidelines recommend that all local and collector streets within traditional neighborhoods provide sidewalks on both sides of the streets unless it is determined to be infeasible due to engineering constraints. Local and collector streets should feature conventional overhead lighting except in new residential subdivisions where pedestrian-scale lighting is preferred. Traditional neighborhoods in historic districts may opt to provide decorative lighting that complements their historic character. The effective curb return radius should be 20 feet for local street intersections and 25 feet for collector street intersections.

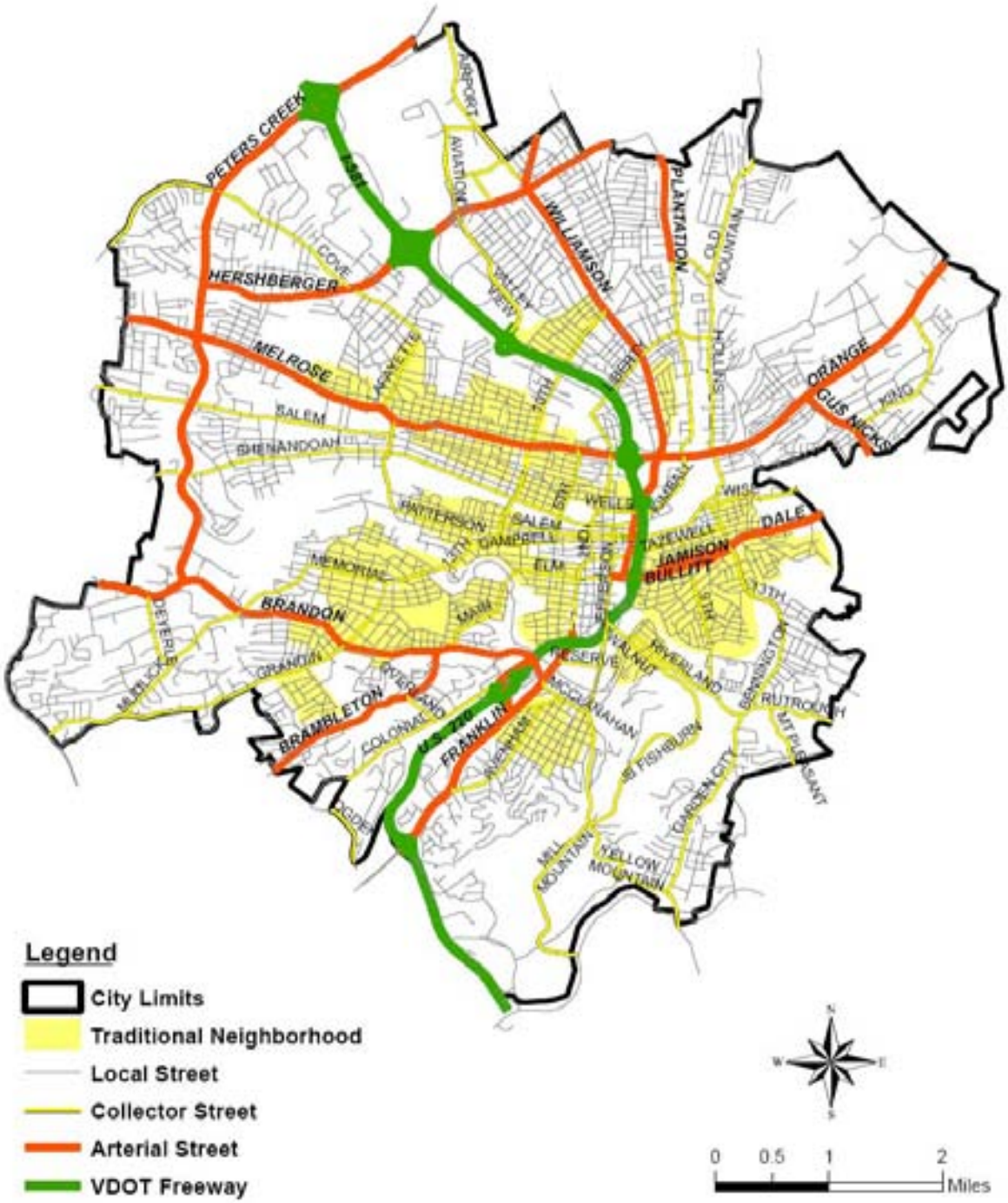
	LOCAL STREETS	**LTN (1a)**	**LTN (1b)**	**LTN (2)**
1.	Travel Zone	11	12	20
2.	Parking Zone	7	14	14
3.	Gutter/Drainage Zone	2	0	0
4.	Curb Zone	1	1	1
5.	Planter/Utilities Zone	8	12	12
6.	Pedestrian Zone	10	10	10
7.	ROW Edge	1	1	1
	TOTAL ROW =	**40**	**50**	**58**

	COLLECTOR STREETS	**CTN (2a)**	**CTN (2b)**	**CTN (2c)**
1.	Travel Zone	21	22	32
2.	Parking Zone	7	14	14
3.	Gutter/Drainage Zone	2	0	0
4.	Curb Zone	1	1	1
5.	Planter/Utilities Zone	8	12	12
6.	Pedestrian Zone	10	10	10
7.	ROW Edge	1	1	1
	TOTAL ROW =	**50**	**60**	**70**

Typical sections LTN (1a) and LTN (1b) are two-way "bypass" streets where traffic shares one travel lane. Typical section CTN (2c) shows a preferred option for a multimodal collector with 5-foot marked bike

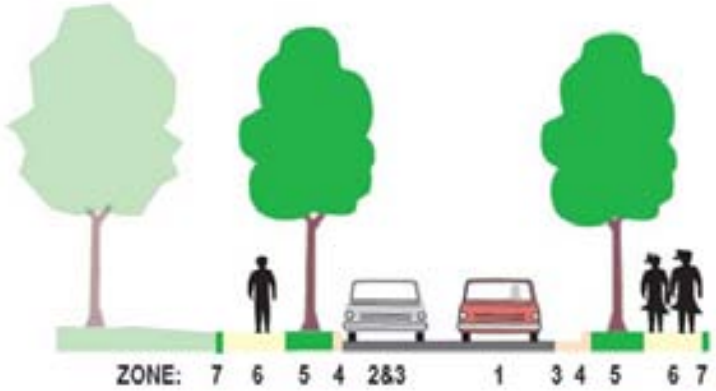
lanes. However, on-street bicycle accommodation can be provided in various ways as shown in the Bicycle Accommodations section.

Traditional Neighborhood Character District

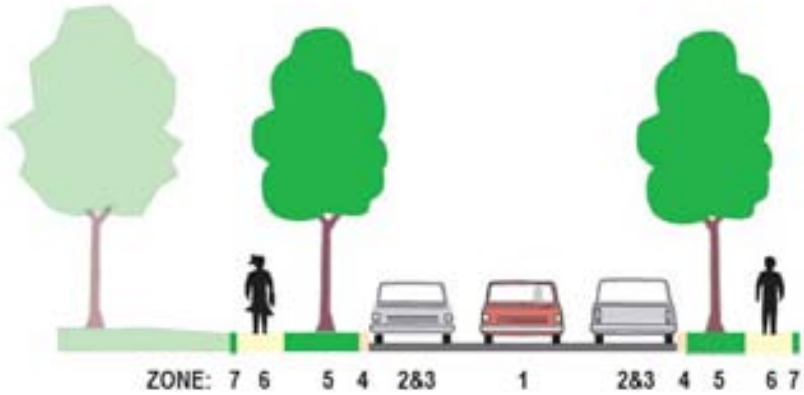


Retrofit Options for

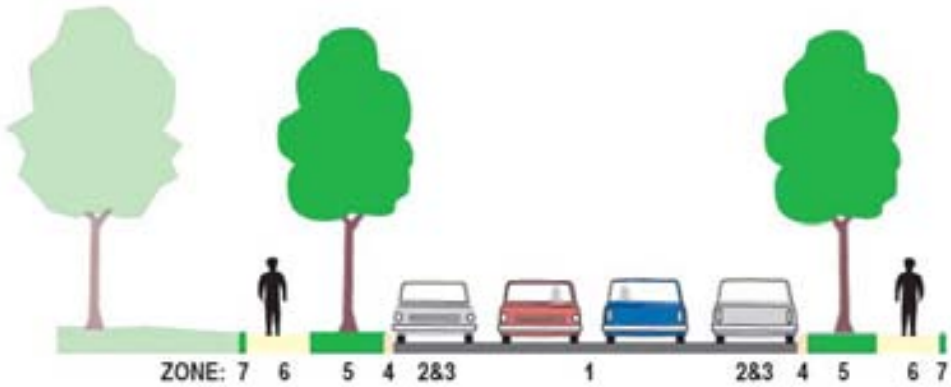
Traditional Neighborhood Character District Local Streets



LTN (1a)
Zone 1: Travel - 11'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 40'

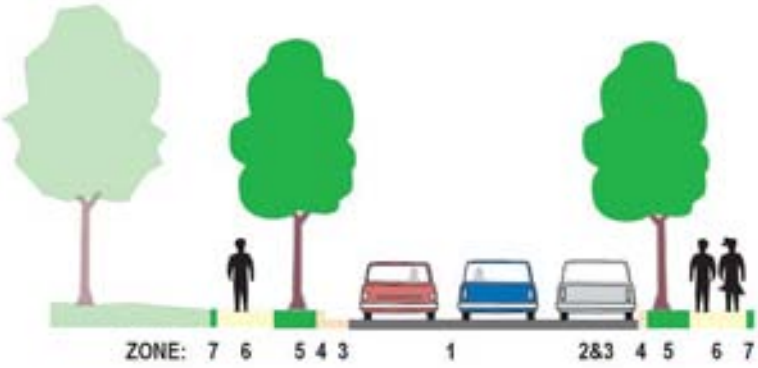


LTN (1b)
Zone 1: Travel - 12'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'

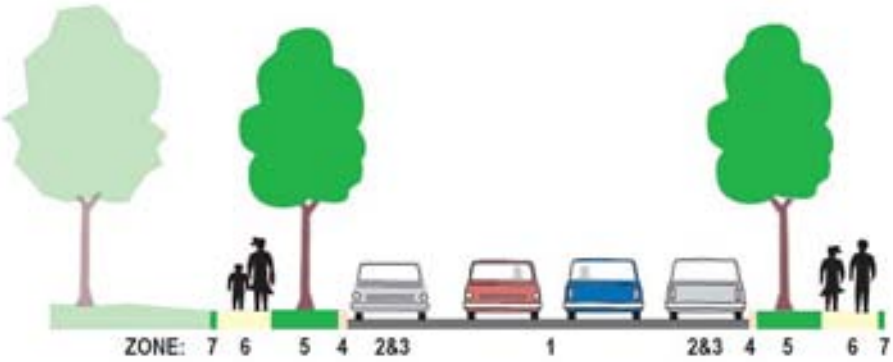


LTN (2)
Zone 1: Travel - 20'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 58'

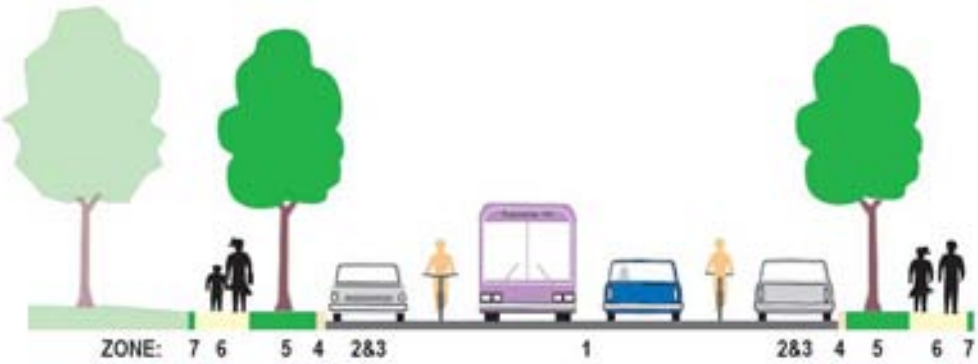
Retrofit and Preferred Multimodal Options for Traditional Neighborhood Character District Collector Streets



CTN (2a)
Zone 1: Travel - 21'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'



CTN (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'



CTN (2c)
Zone 1: Travel - 32'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 70'

Suburban Neighborhood

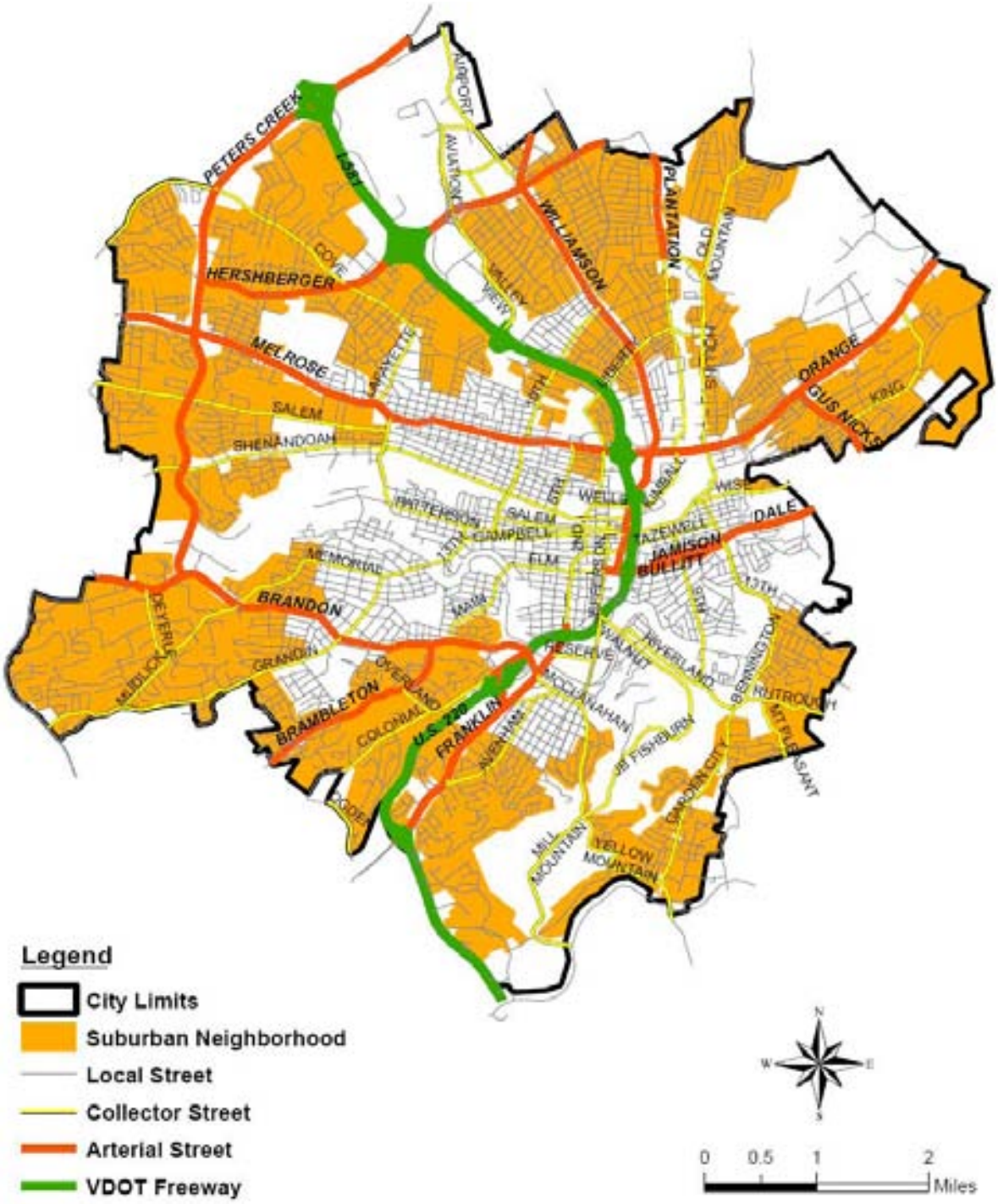
Suburban neighborhoods occupy the largest amount of land area in the City as compared to other character districts. The following map shows the distribution of suburban neighborhoods. Typically, these neighborhood streets do not feature pedestrian or bicycle accommodations since automobile accommodation was the main focus when they were originally developed. In order to better accommodate all street users, all suburban neighborhood streets should provide some type of pedestrian accommodation as described in Vision 2001-2020: *"Street improvements within suburban neighborhoods should focus on greater connection, pedestrian amenities, and reduction of pavement width."*

Many of the following suburban neighborhood typical sections show options to provide pedestrian accommodation either in the form of sidewalks or shared-use paths. All streets should provide one of these types of pedestrian accommodation on one or both sides of the street, unless it is determined that providing the accommodation is infeasible or undesired by residents. New residential streets follow LSB (1b) or LSB (2b), which are the same typical sections as LTN (1b) or LTN (2) in the traditional neighborhood guidelines.

The Bicycle Accommodation section of this manual explains how to incorporate bicycle accommodation into the street design. Typical sections (2d), (2e), and (3c) show how collector streets may provide accommodation for all modes of transportation. Typical section LSB (1a), LSB (1b), and LSB (1c) are two-way "bypass" streets where traffic shares one travel lane. Typical section LSB (2c) presents an option for reducing pavement width and providing pedestrian accommodation where the outside curbs already exist.

The effective curb return radius should be 20 feet for local street intersections and 25 feet for collector street intersections. Local and collector streets should feature conventional overhead lighting except in new residential subdivisions where pedestrian-scale lighting is preferred.

Suburban Neighborhood Character District



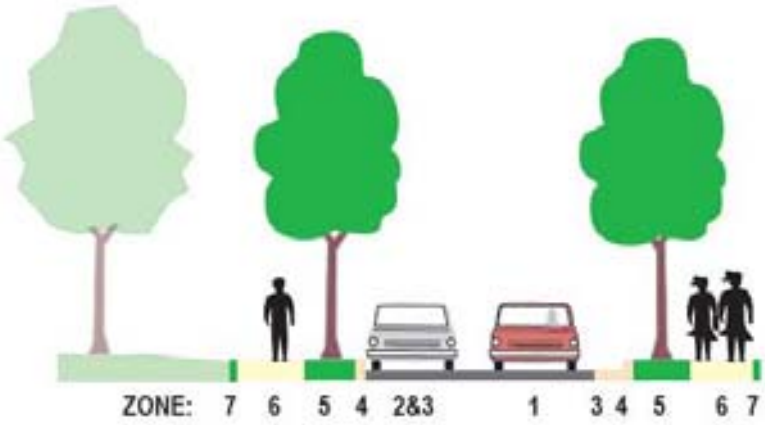
SUBURBAN NEIGHBORHOODS

	LOCAL STREETS	**LSB (1a)**	**LSB (2a)**	**LSB (1b)**	**LSB (1c)**	**LSB (2b)**	**LSB (2c)**
1.	Travel Zone	11	21	12	16	20	21
2.	Parking Zone	7	7	14	14	14	14
3.	Gutter/Drainage Zone	2	12	0	20	0	0
4.	Curb Zone	1	0	1	0	1	2
5.	Planter/Utilities Zone	8	0	12	0	12	10
6.	Pedestrian Zone	10	0	10	0	10	10
7.	ROW Edge	1	0	1	0	1	1
	TOTAL ROW =	**40**	**40**	**50**	**50**	**58**	**58**

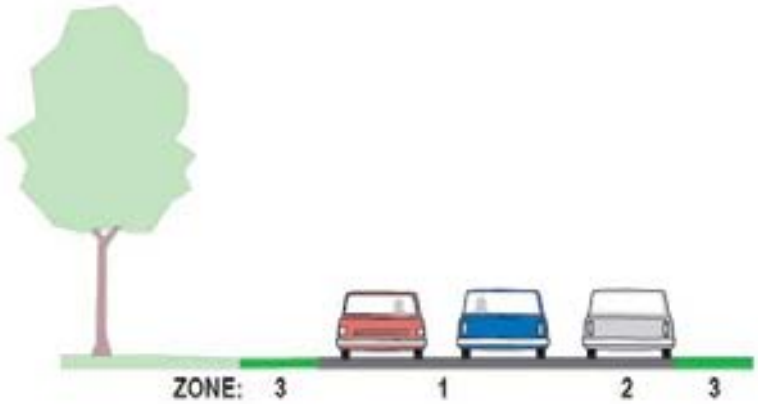
		LOCAL OR COLLECTOR STREETS			***COLLECTOR STREETS***		
		LCSB (2a)	**LCSB (2b)**	**LCSB (2c)**	**CSB (2a)**	**CSB (2b)**	**CSB (2c)**
1.	Travel Zone	20	22	22	20	22	22
2.	Parking Zone	0	0	0	0	0	7
3.	Gutter/Drainage Zone	0	4	4	0	4	2
4.	Curb Zone	1	1	1	1	1	1
5.	Planter/Utilities Zone	8	12	14	8	12	9
6.	Pedestrian Zone	10	10	15	10	10	8
7.	ROW Edge	1	1	2	1	1	1
	TOTAL ROW =	**40**	**50**	**58**	**40**	**50**	**50**

	COLLECTOR STREETS	**CSB (2d)**	**CSB (2e)**	**CSB (3a)**	**CSB (3b)**	**CSB (3c)**
1.	Travel Zone	30	28	33	22	28
2.	Parking Zone	7	0	0	0	0
3.	Gutter/Drainage Zone	2	4	4	4	4
4.	Curb Zone	1	1	1	2	2
5.	Planter/Utilities Zone	9	14	11	26	28
6.	Pedestrian Zone	10	15	10	15	15
7.	ROW Edge	1	3	1	3	3
	TOTAL ROW =	**60**	**65**	**60**	**72**	**80**

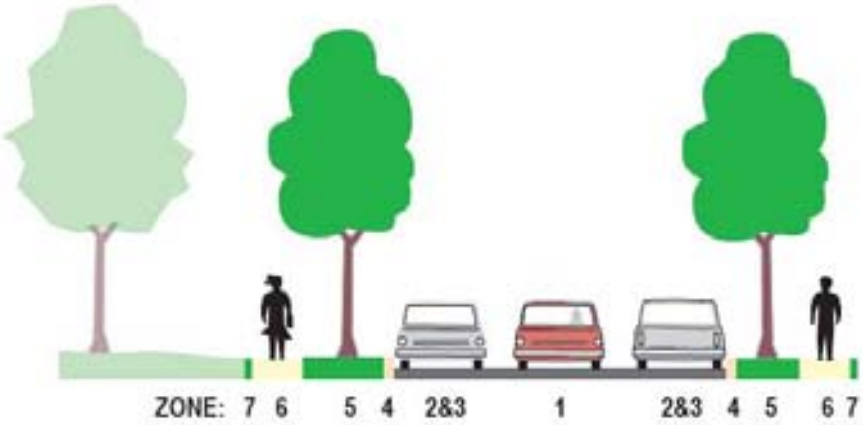
Retrofit Options for
Suburban Neighborhood Character District
Local Streets



LSB (1a)
Zone 1: Travel - 11'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 40'



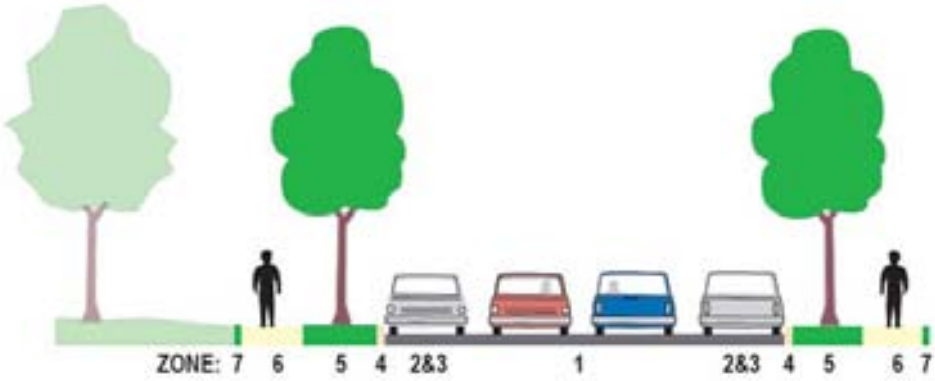
LSB (2a)
Zone 1: Travel - 21'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 12'
Zone 4: Curb - 0'
Zone 5: Planter/Utilities - 0'
Zone 6: Pedestrian - 0'
Zone 7: ROW Edge - 0'
Total ROW: 40'



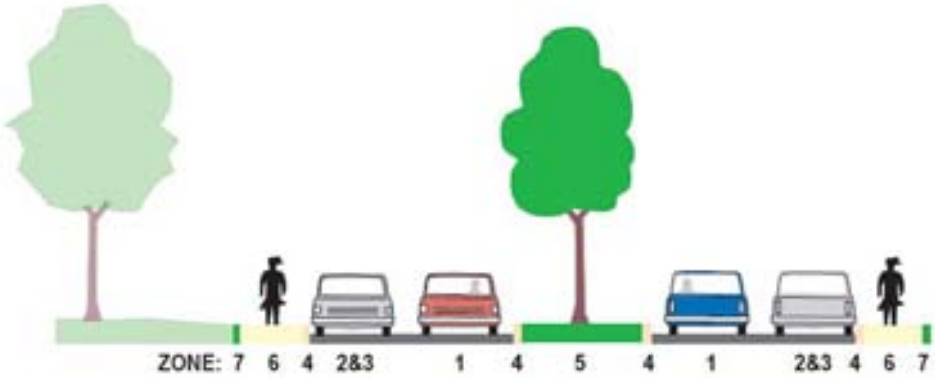
LSB(1b)
Zone 1: Travel - 12'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'

Retrofit Options for
Suburban Neighborhood Character District
Local Streets

LSB (1c)
Zone 1: Travel - 16'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 20'
Zone 4: Curb - 0'
Zone 5: Planter/Utilities - 0'
Zone 6: Pedestrian - 0'
Zone 7: ROW Edge - 0'
Total ROW: 50'



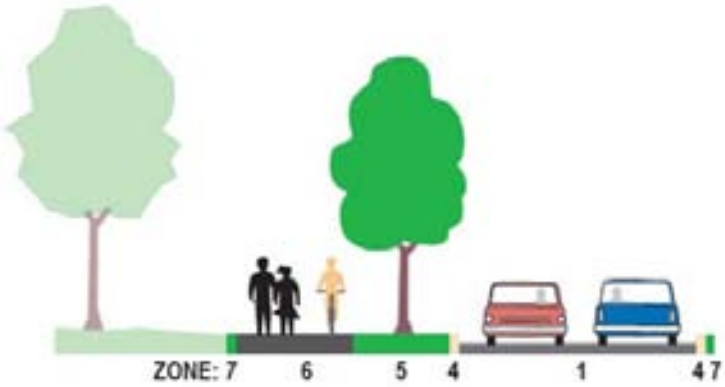
LSB (2b)
Zone 1: Travel - 20'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 58'



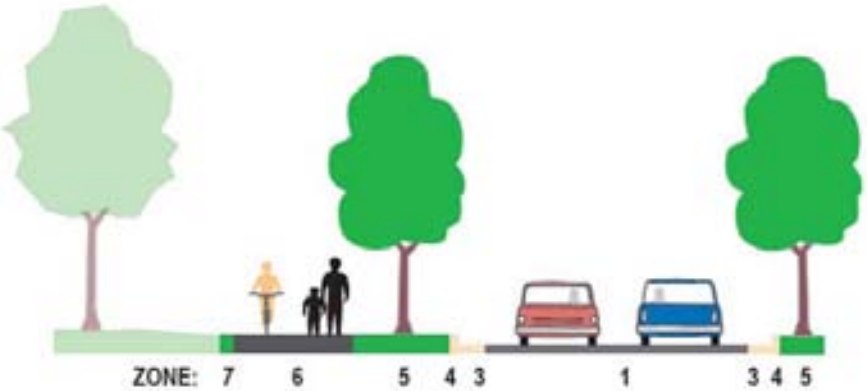
LSB (2c)
Zone 1: Travel - 21'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 10'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 58'

Retrofit Options for

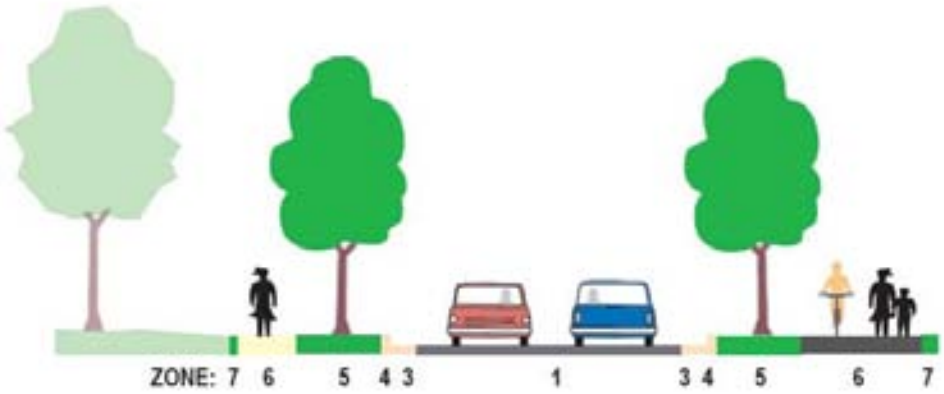
Suburban Neighborhood Character District
Local or Collector Streets



LCSB (2a)
Zone 1: Travel - 20'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 40'



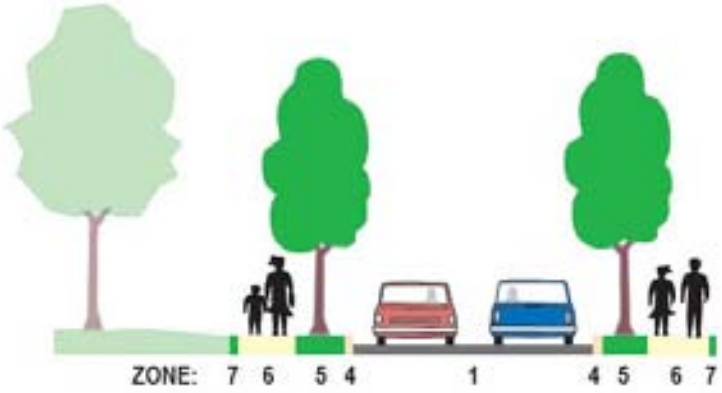
LCSB (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12' (8'/4')
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'



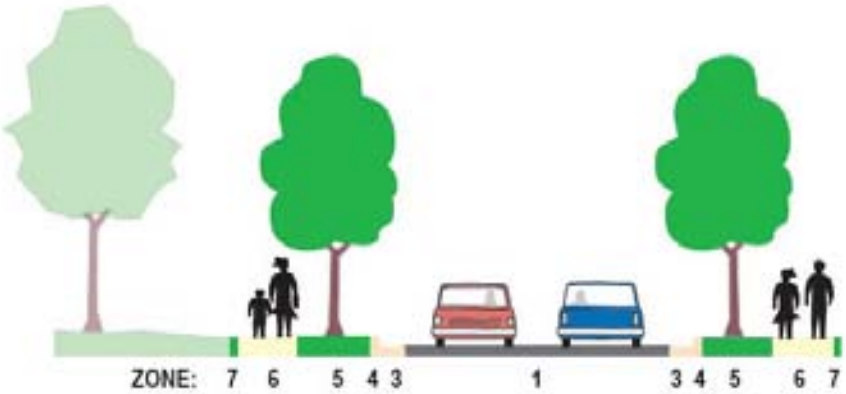
LCSB (2c)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 15'
Zone 7: ROW Edge - 2'
Total ROW: 58'

Retrofit Options for

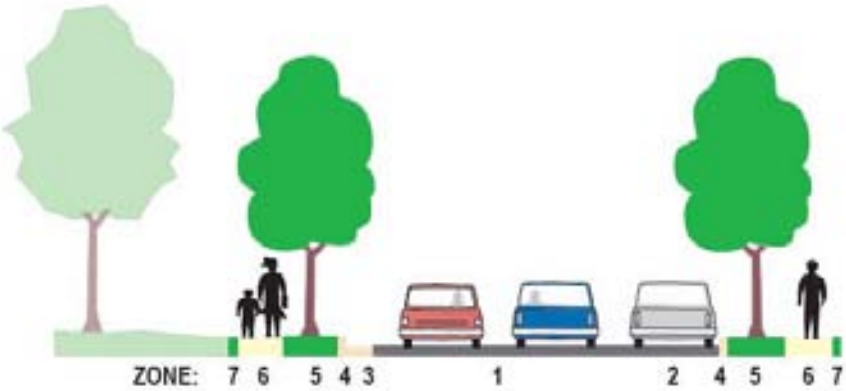
Suburban Neighborhood Character District Collector Streets



CSB (2a)
Zone 1: Travel - 20'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 40'

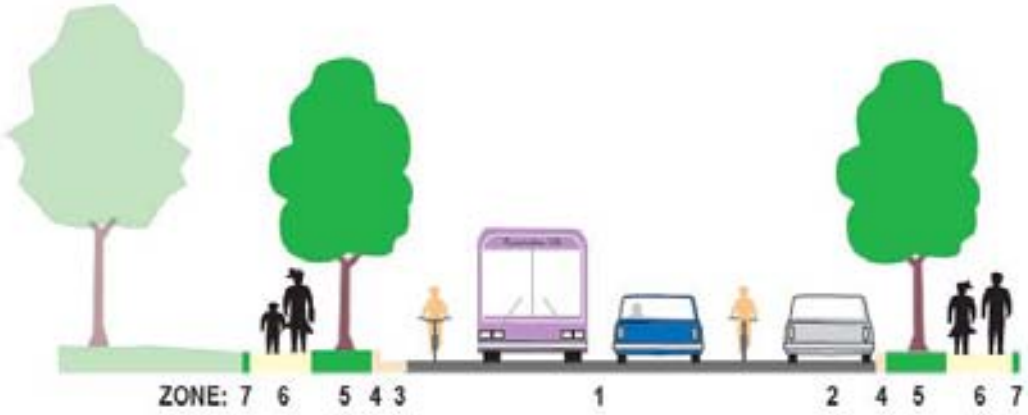


CSB (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'

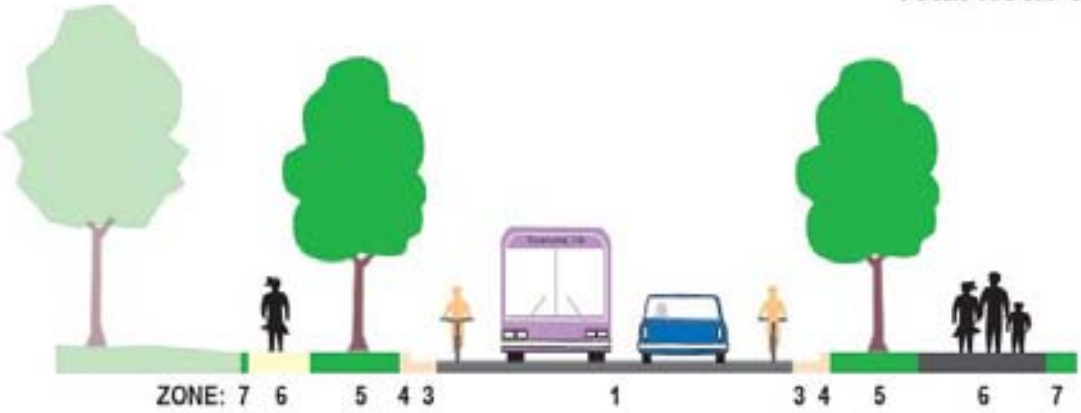


CSB (2c)
Zone 1: Travel - 22'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 9'
Zone 6: Pedestrian - 8'
Zone 7: ROW Edge - 1'
Total ROW: 50'

Preferred Multimodal Options for Suburban Neighborhood Character District Collector Streets



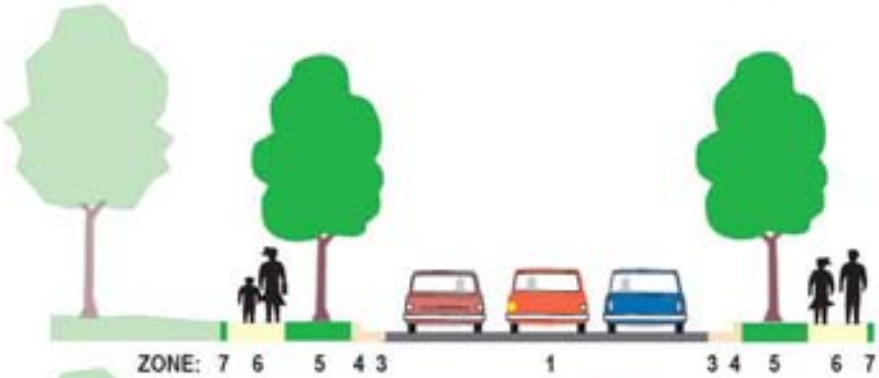
CSB (2d)
Zone 1: Travel - 30'
Zone 2: Parking - 7'
Zone 3: Gutter/Drainage - 2'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 9'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'



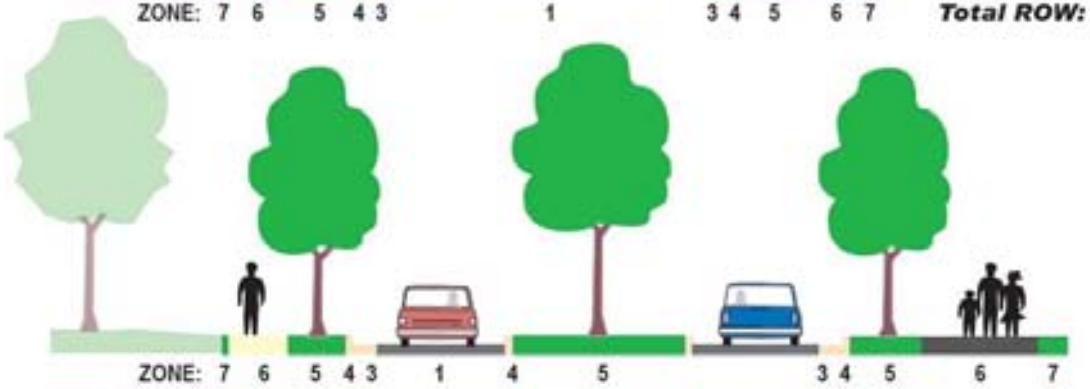
CSB (2e)
Zone 1: Travel - 28'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 14'
Zone 6: Pedestrian - 15' (5'/10')
Zone 7: ROW Edge - 3' (6"/2'-6")
Total ROW: 65'

Suburban Neighborhood Character District Collector Streets

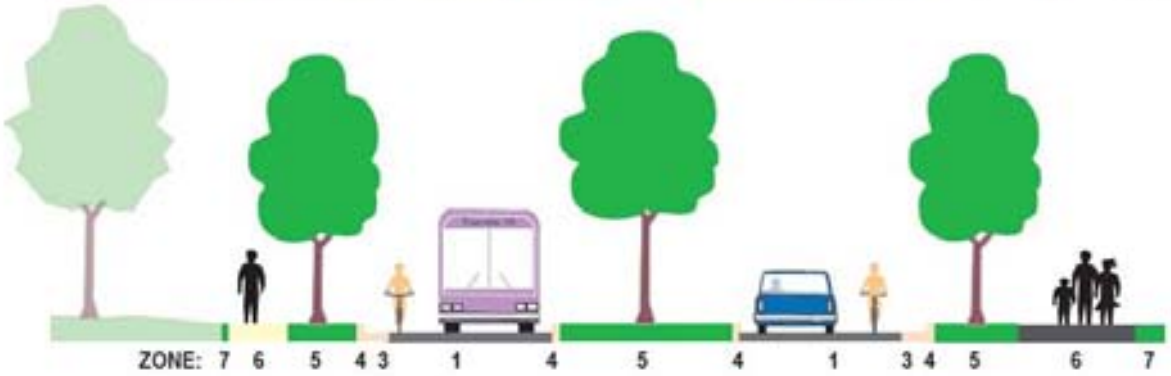
CSB (3a) and CSB (3b) are retrofit options. CSB (3c) is a preferred multimodal option.



CSB (3a)
Zone 1: Travel - 33'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 11'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'



CSB (3b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 26' (5'/15'/6')
Zone 6: Pedestrian - 15' (5'/10')
Zone 7: ROW Edge - 3' (6"/2'-6")
Total ROW: 72'



CSB (3c)
Zone 1: Travel - 28'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 28' (6'/15'/7')
Zone 6: Pedestrian - 15' (5'/10')
Zone 7: ROW Edge - 3' (6"/2'-6")
Total ROW: 80'

Local Commercial and Regional Commercial

Note that most local commercial and regional commercial character districts fall along arterial streets. Therefore, the typical sections in the Arterial section should be referenced.

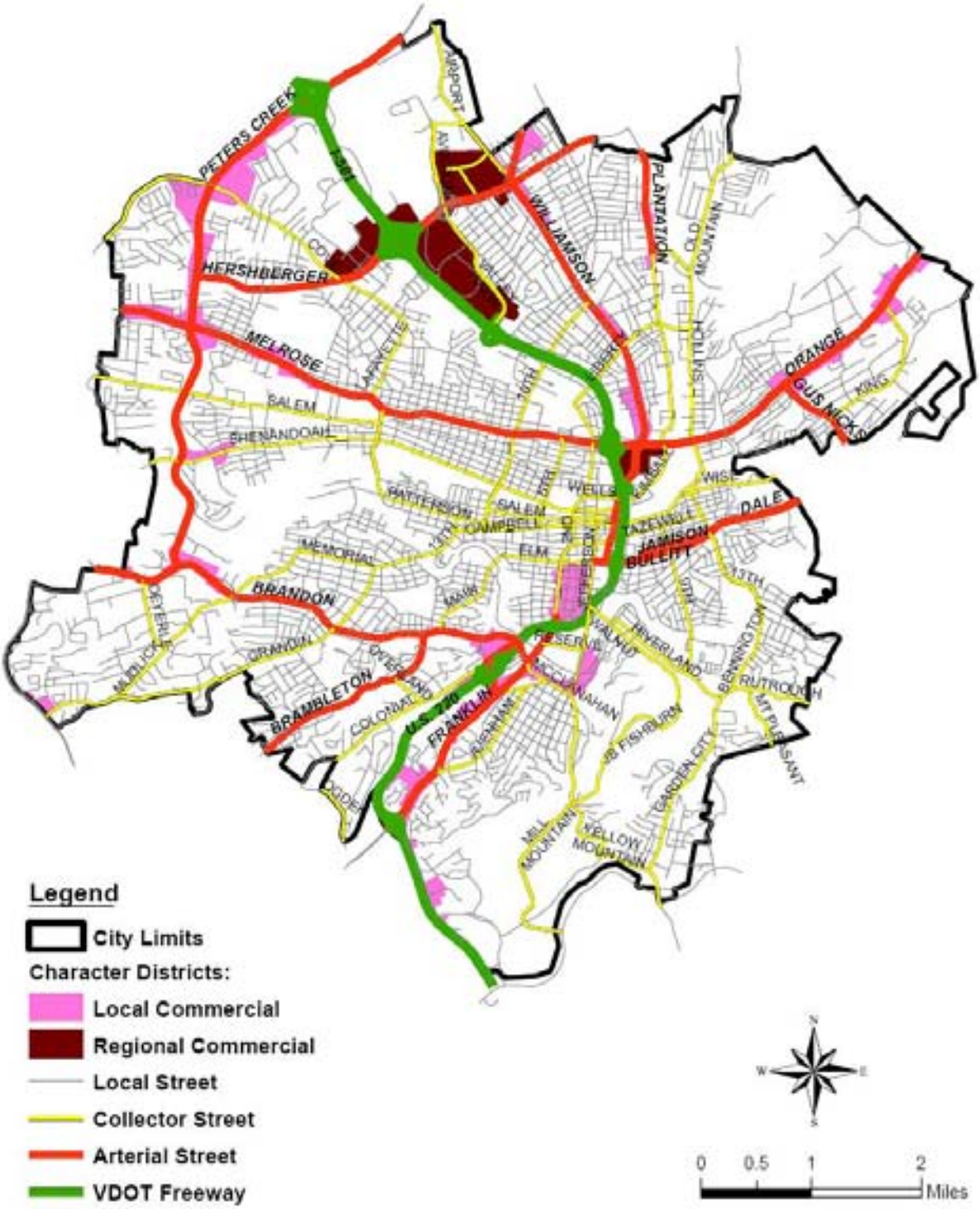
Utilities along collector streets in local commercial or regional commercial character districts should not cross the street. The effective curb return radius should be 25 feet for local street intersections and 35 feet for collector street intersections.

	LOCAL OR COLLECTOR STREETS	**COM (2a)**	**COM (2b)**	**COM (3)**
1.	Travel Zone	22	22	33
2.	Parking Zone	0	0	0
3.	Gutter/Drainage Zone	4	4	4
4.	Curb Zone	1	1	1
5.	Planter/Utilities Zone	0	12	11
6.	Pedestrian Zone	12	10	10
7.	ROW Edge	1	1	1
	TOTAL ROW =	**40**	**50**	**60**

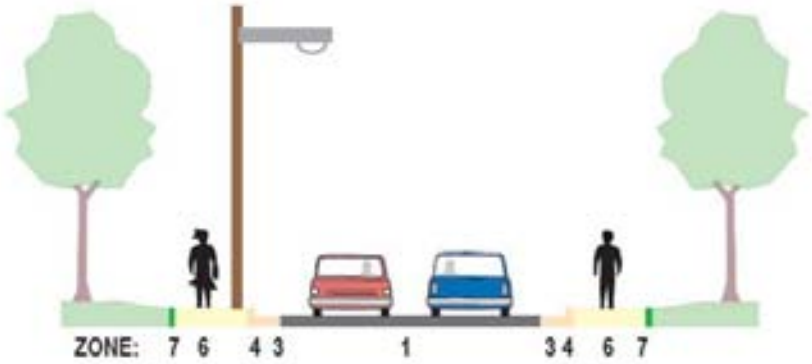
	LOCAL OR COLLECTOR STREETS	**COM (4a)**	**COM (4b)**	**COM (4c)**
1.	Travel Zone	44	44	44
2.	Parking Zone	0	0	0
3.	Gutter/Drainage Zone	4	4	4
4.	Curb Zone	1	1	2
5.	Planter/Utilities Zone	0	10	19
6.	Pedestrian Zone	10	10	10
7.	ROW Edge	1	1	1
	TOTAL ROW =	**60**	**70**	**80**

These retrofit options do not show bicycle accommodations. However, bicycle accommodations are encouraged where identified as appropriate through regional and city plans. The provision of bicycle accommodations should follow the guidance provided in the General Streetscape Element Guidelines.

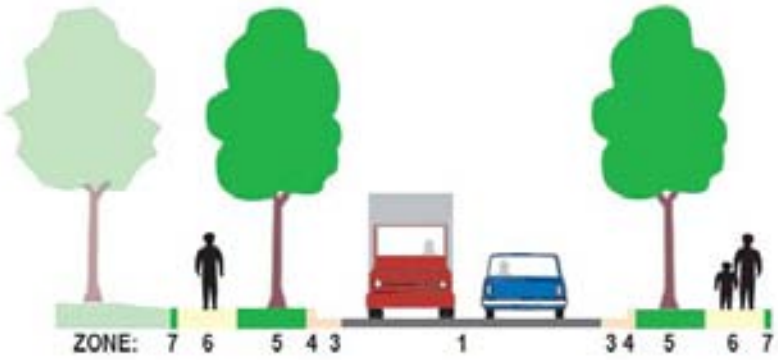
Local Commercial and Regional Commercial Character Districts



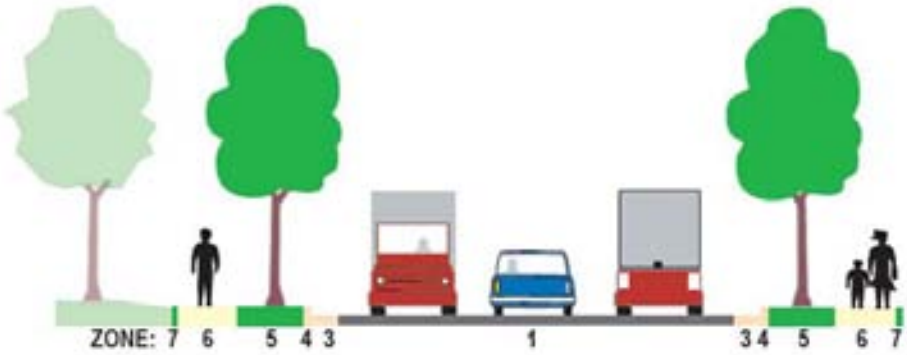
Retrofit Options for
Local and Regional Commercial Character Districts
Local and Collector Streets



COM (2a)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 0'
Zone 6: Pedestrian - 12'
Zone 7: ROW Edge - 1'
Total ROW: 40'

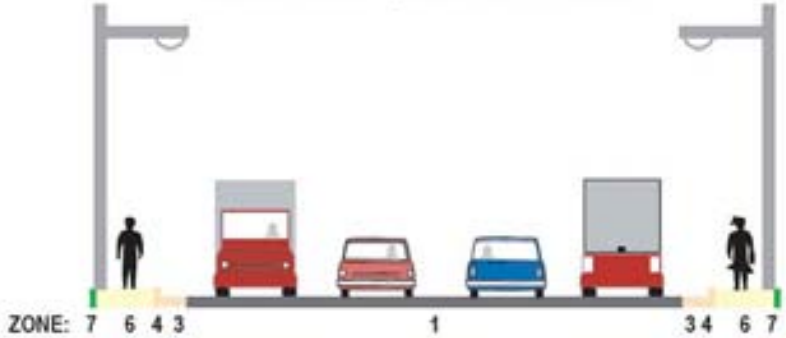


COM (2b)
Zone 1: Travel - 22'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 12'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'

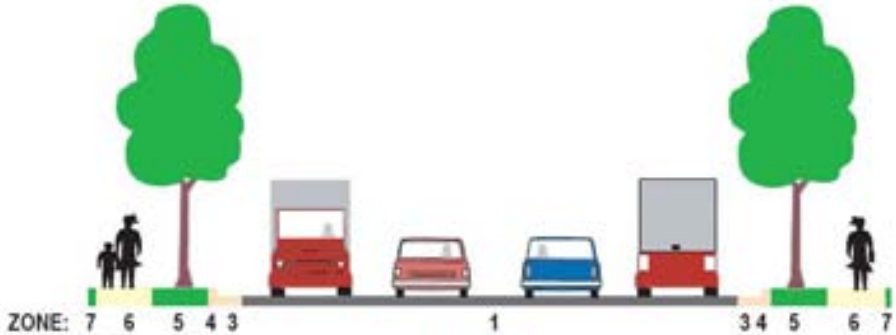


COM (3)
Zone 1: Travel - 33'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 11'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'

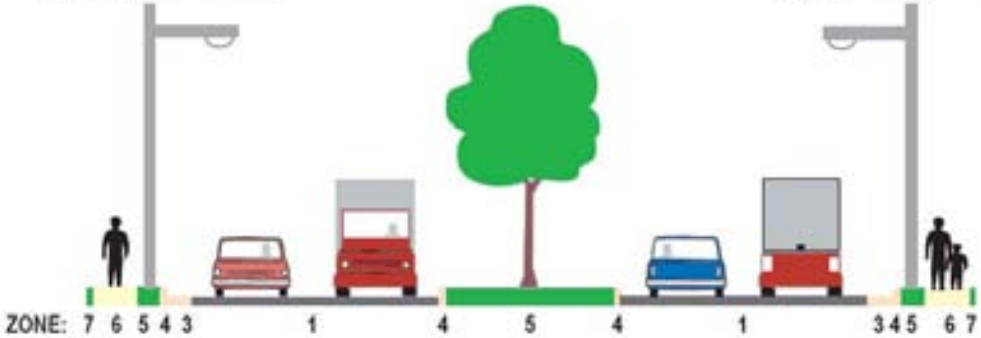
Retrofit Options for
Local and Regional Commercial Character Districts
Local and Collector Streets



COM (4a)
Zone 1: Travel - 44'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 0'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'



COM (4b)
Zone 1: Travel - 44'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 10'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 70'



COM (4c)
Zone 1: Travel - 44'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 2'
Zone 5: Planter/Utilities - 19' (2'/15'/2')
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 80'

Industrial

Local and collector streets in the industrial character district should provide conventional overhead lighting. The effective curb return radius for local or collector street intersections is 35 feet.

The table below and the typical sections that follow describe the recommendations for streets in industrial districts.

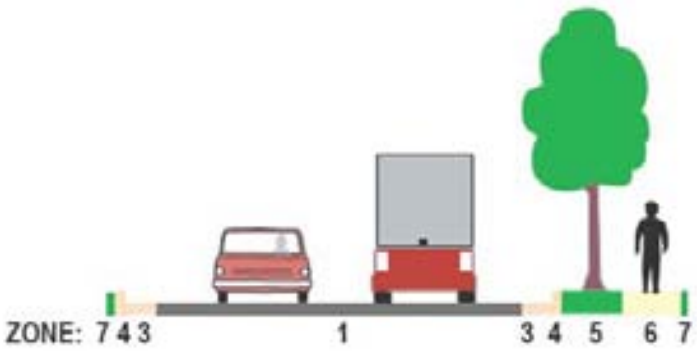
	LOCAL or COLLECTOR STREETS	**LCIND (2a)**	**LCIND (2b)**
1.	Travel Zone	26	26
2.	Parking Zone	0	0
3.	Gutter/Drainage Zone	4	4
4.	Curb Zone	1	1
5.	Planter/Utilities Zone	4	8
6.	Pedestrian Zone	4	10
7.	ROW Edge	1	1
	TOTAL ROW =	**40**	**50**

	COLLECTOR STREETS	**CIND (2c)**	**CIND (4)**
1.	Travel Zone	24	44
2.	Parking Zone	14	0
3.	Gutter/Drainage Zone	0	4
4.	Curb Zone	1	1
5.	Planter/Utilities Zone	10	10
6.	Pedestrian Zone	10	10
7.	ROW Edge	1	1
	TOTAL ROW =	**60**	**70**

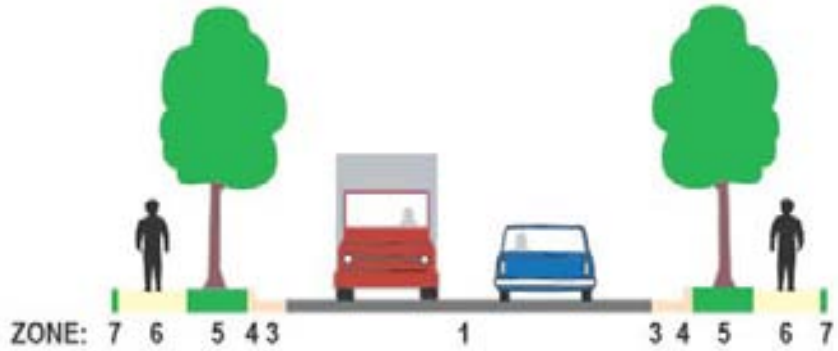
These retrofit options do not show bicycle accommodations. However, bicycle accommodations are encouraged where identified as appropriate through regional and city plans. The provision of bicycle accommodations should follow the guidance provided in the General Streetscape Element Guidelines.

Industrial Character District

Retrofit Options for Industrial Character District Local and Collector Streets



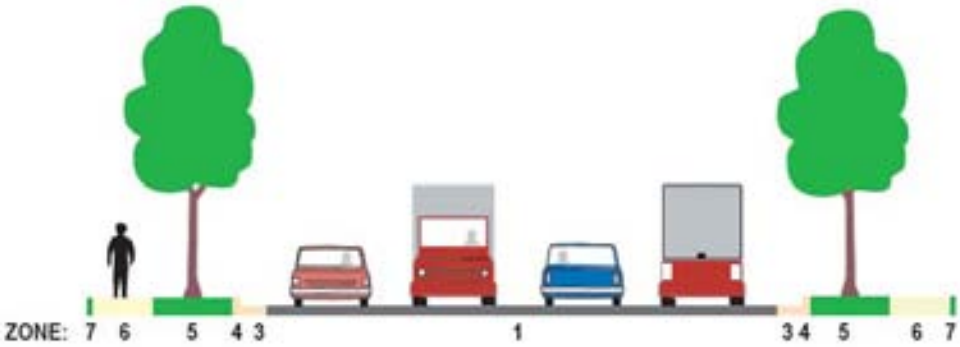
LCIND (2a)
Zone 1: Travel - 26'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 4'
Zone 6: Pedestrian - 4'
Zone 7: ROW Edge - 1'
Total ROW: 40'



LCIND (2b)
Zone 1: Travel - 26'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 8'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 50'

Retrofit Options for Industrial Character District Collector Streets

CIND (2c)
Zone 1: Travel - 24'
Zone 2: Parking - 14'
Zone 3: Gutter/Drainage - 0'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 10'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 60'



CIND (4)
Zone 1: Travel - 44'
Zone 2: Parking - 0'
Zone 3: Gutter/Drainage - 4'
Zone 4: Curb - 1'
Zone 5: Planter/Utilities - 10'
Zone 6: Pedestrian - 10'
Zone 7: ROW Edge - 1'
Total ROW: 70'

Best Practices for Complete Streets

October 2005

Sacramento Transportation & Air Quality
COLLABORATIVE

Table of Contents

INTRODUCTION 1

I. Street Design Concepts 2
II. Street Width 2
III. Block Length 5
IV. Connectivity 5
V. Pedestrians and Bicycle Amenities 6
VI. Examples from Selected Cities 8
A. Sacramento 8
B. Eugene, Oregon 9

SUGGESTED STREET STANDARDS 10

VII. Local Streets 10
VIII. Collector Streets 10
IX. Arterial Streets 10

MAKING STREETS MATCH THEIR CONTEXT 18

PLANNING FOR TRANSIT 20

RE-DEVELOPMENT IN CONSTRAINED RIGHT-OF-WAYS 22

LOCAL EXAMPLES 23

Table of Figures

Figure 1: Relationship Between Pavement Width and Speed 2
Figure 2: Neighborhood Street Sizes 4
Figure 3: Relationship Between Unimpeded Block Length and Speed 5
Figure 4: An Example of Poor Street Connectivity in the Sacramento Area 6
Figure 5: Street Standards 11
Figure 6: Low-Volume Local Residential Street 13
Figure 7: Local Industrial Street 14
Figure 8: Front-Loading Residential Collector 15
Figure 9: Main Street 16
Figure 10: Minor Commercial Arterial Street 17
Figure 11: Combinations of Street Types and Functional Classifications 18

INTRODUCTION

Historically, jurisdictions have relied on street standards based on the anticipated traffic volume of a given street without consideration of adjacent land uses. This volume-oriented approach, while simple and direct, does not allow the street designer much flexibility when creating a new street. Moreover, it often results in streets that perform poorly in other respects, such as serving pedestrians and bicyclists and in enhancing the visual appeal and quality-of-life of the area it serves. This document outlines an approach to designing streets that are more "complete" in the sense of accomplishing all of the goals associated with the dominant form of public space in urban societies – our streets.

The purpose of this booklet is threefold:

- To provide suggested street standards for use when designing new streets and developments and when planning for future transit corridors
- To provide guidance when dealing with a constrained right-of-way
- To illustrate local examples of streets that work or do not work for various user groups

This booklet focuses on urban and suburban streets in accordance with the urban focus of the visioning exercise. Rural roads warrant a different type of evaluation and a different set of standards. In some parts of Sacramento County rural roads are being transformed into urban streets due to development of nearby properties. In such cases these guidelines may be helpful in determining the right-of-way that should be preserved to allow for a successful transition to urban standards.

This booklet provides some suggestions on traffic calming features that can be built-into street designs, but it is not intended to address the broader topic of traffic calming, for which guidance is available from several other documents[1]. Traffic calming measures are largely intended to address unforeseen problems that arise after roadways are constructed. While traffic calming can be included in the initial design of streets, the specific treatments are a function of very localized circumstances.

[1] For example *Traffic Calming – State of the Practice*, Reid Ewing for FHWA, 1999

I. Street Design Concepts

Complete streets are those that adequately provide for all roadway users, including bicyclists, pedestrians, transit riders, and motorists, to the extent appropriate to the function and context of the street. American streets were once quite successful in this regard. However, for several decades there was a drift towards a focus on the automobile. More recently there has been a growing recognition that minimizing driving delay should not be the only goal of a roadway and may even be undesirable depending on the context. Street design is now recognized as an important determinant of neighborhood character and quality of life. This has resulted in growing public pressure to:

- Improve the functionality and appearance of new streets
- Facilitate pedestrian and bicycle travel
- Reduce the potential for speeding and other safety problems without resorting to speed bumps
- Introduce desirable design elements, such as landscaped strips and detached sidewalks that are commonly found in older residential neighborhoods
- Use shorter blocks in certain environments, such as along residential, commercial, and downtown corridors, to slow traffic and shorten walking distances.

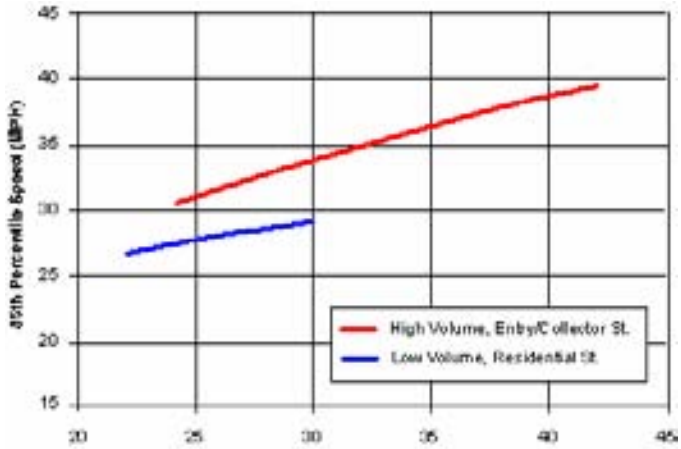
II. Street Width

Research shows that narrower streets result in slower travel speeds. For example, a recent study conducted in the City of Longmont, Colorado (population 72,000) looked at 20,000 police collision reports to determine the effect of street design in contributing to accidents. The most significant relationship between injury accidents and street design was found to be with street width and curvature. As street widths widen, accidents per mile increase exponentially.[2]

Additional research has found that[3]:

- Wider streets experience higher average and 85th percentile speeds than narrow streets. Residents' perception of the impact of traffic on quality of life correlates strongly and negatively with speeds. Where speeds are high, residents are more likely to perceive a degraded quality of life

Figure 1: Relationship Between Pavement Width and Speed



Source: City of San Antonio, Texas

[2] Peter Swift, "Residential Street Typology and Injury Accident Frequency" , 2003

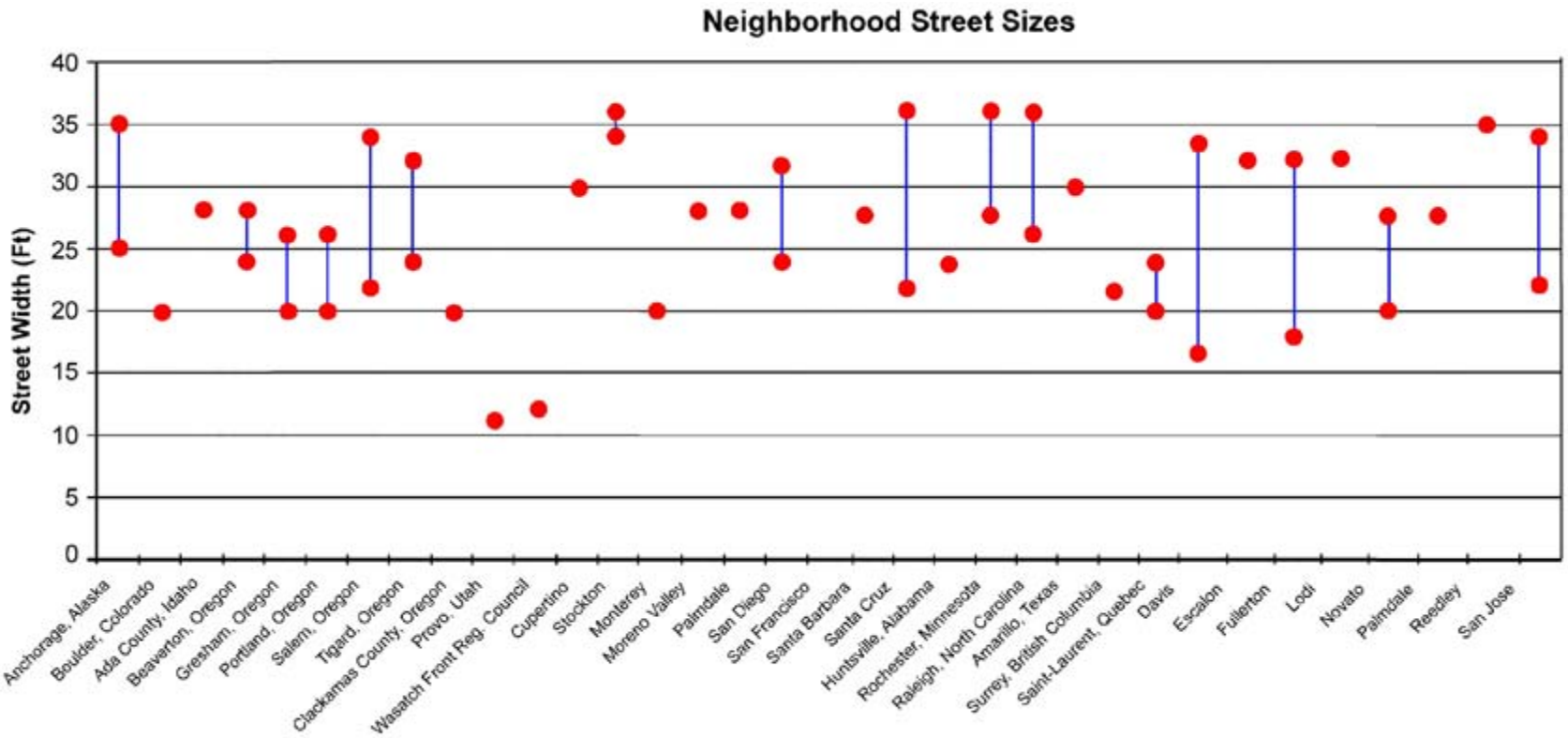
[3] James Daisa and John Peers, Fehr & Peer, "Narrow Residential Streets: Do They Really Slow Down Speeds", 1997; and Matthew Ridgway, Fehr & Peers, "Residential Streets – Quality of Life Assessment", 1997

- On-street parking significantly affects speeds. On-street parking on both sides of the street visually narrows the street for those traveling along it. High parking densities on narrow streets can dramatically reduce travel speeds. Narrow streets with low parking density have an effective width similar to wide streets with high parking density. Narrow streets with high parking density have the highest "traffic calming" effect. On-street parking also provides a buffer between pedestrians and traffic.

Because street standards are determined locally and practices have evolved over time, there are great variations in residential street widths. Figure 2 depicts the range of neighborhood street widths found in the street standards of thirty-four communities. Much of the variation has to do with whether on-street parking is permitted. Nevertheless, the fact that widths vary by a factor of three in cities with the same sized automobiles, fire trucks, etc. indicates that there is more freedom to match street widths to the local context than most people realize.

Effect of Width: *Wide, straight, long streets are an invitation to speed. Frequent speed humps are needed to counteract the tendency to speed on this overly wide (40ft curb-to-curb) street.*

Figure 2: Neighborhood Street Sizes



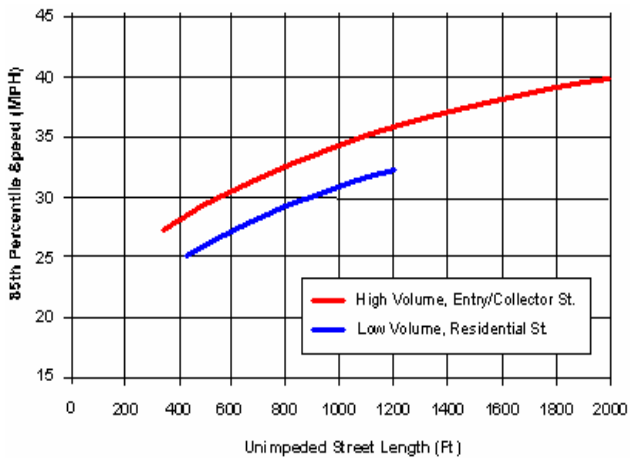
Source: Neighborhood Traffic Management Survey, Ransford S. McCourt, 1996 ITE District 6, Compendium of Technical Papers. City of Stockton.

III. Block Length

The City of San Antonio, Texas, received many complaints regarding speeding in residential areas. Citizens perceived speeding on residential streets as a quality-of-life issue. Efforts ensued to implement traffic calming measures on existing streets. As part of this effort, data was collected to establish a relationship between travel speeds, unimpeded block length and street width. Unimpeded block length is the distance drivers may travel on a particular street segment without being required to slow or stop.

The study found (see Figure 3) that streets exceeding 600 feet in unimpeded block length typically had 85th percentile speeds exceeding the legal speed limit[4]. As a result of these findings, new street standards were developed that limited the unimpeded street length to 900 feet when traffic volume exceeds 500 vehicles per day and further limits the unimpeded street length to 700 feet in some cases.

Figure 3: Relationship Between Unimpeded Block Length and Speed



Block length also affects pedestrian routing; for example by reducing the likelihood of jaywalking. A grid pattern of short blocks provides pedestrians a choice of blockfaces from which to choose a pleasant path. This issue is taken up further in the next section.

IV. Connectivity

One unintended consequence of the drift towards wide residential streets with long blocks was that traffic began to cut through residential neighborhoods, since speeds were similar to those on collector streets. Instead of reducing widths, the typical response to cut-through traffic was widespread use of dead-end cul-de-sacs. Not only individual streets but entire neighborhoods were designed with only one exit or two exits that were both on the same blockface.

As can be seen in the example below, one effect of these cul-de-sacs is to force all traffic onto the arterial roads. At the same time, unless these cul-de-sacs are permeable to bicyclists and pedestrians they too will be forced to use the arterial corridors, which creates conflicts and safety issues. Moreover, this design lengthens non-auto trips to the point where they may become impractical.

[4] For residential streets the speed limit is 30MPH in San Antonio. The California Vehicle Code sets the prima facie speed limit for residential streets at 25MPH, which implies that block lengths should be shorter in California than in San Antonio.

Figure 4: An Example of Poor Street Connectivity in the Sacramento Area

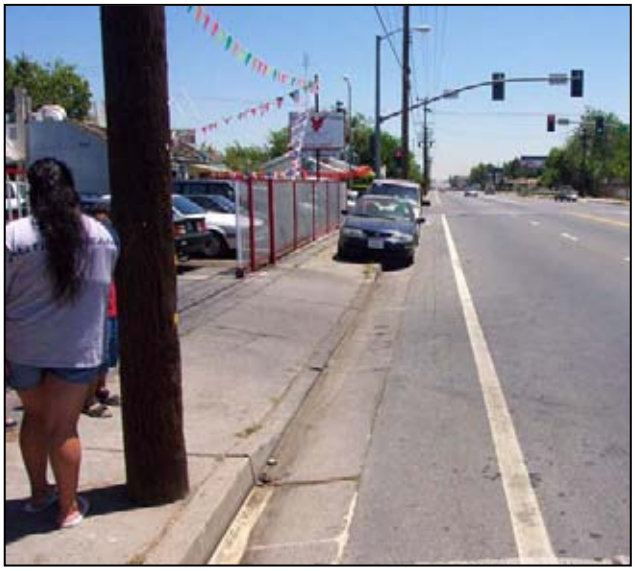
In the last decade there has been a movement towards adopting street standards that encourage greater connectivity. Street design should include road access in at least two directions and ped/bike access in at least three directions where this is not precluded by wholly incompatible adjacent land uses.

V. Pedestrian and Bicycle Amenities

It is an all-too-common planning error to assume that pedestrian facilities are optional or only needed for walking trips. In fact, almost all trips involve walking outdoors at one or both ends. The success of rail and bus transit, but also auto-oriented facilities like city-owned parking garages, depends to some extent on the quality of the pedestrian experience leading to and from the site.

Unsafe Conditions: *Sometimes people must walk whether a safe place to do so is provided or not. This mother is taking her child to a daycare center located on a road with no pedestrian facilities*

Pedestrians and bicyclists are more exposed to the environment than auto users and so are more sensitive to design features such as the width and location of sidewalks, the presence of planting strips, shading, and street crossing conditions. The photos below show how different two walking environments can be even when sidewalks are provided in both.



The mere existence of a sidewalk is not enough; quality also matters. *The street at left has a wide sidewalk and planting strip. The sidewalk at right is narrow, sloped, and has no shade except from utility poles that partially block the sidewalk. There is no buffer between pedestrians and cars; in fact, cars intrude into the pedestrian realm*

Given Sacramento's climate, the issue of shading, and thus planter strips, is particularly important. It is ironic that some cities in California require shade trees to be planted in parking lots yet forbid the creation of planting strips that would shade on-street parking.

Additional design elements that should be considered on a case-by-case basis are bulbouts, street furniture, and display windows. In urban areas, the installation of bicycle lanes and routes can facilitate bicycle travel.

Street Furniture: *Where space permits, street furniture can enhance the attractiveness of a street as well as providing resting places that extend the distance people are willing to walk*

VI. Examples from Selected Cities

Many cities have revised their street design standards in recent years to include at least some of the design concepts discussed on the preceding pages. Here are two examples:

A. Sacramento

The City of Sacramento updated its streets design standards in 1998. The update was in response to a consistent message from residents that the previous set of standards did not result in livable neighborhoods, protests from the development community that the previous standards were too rigid, and City staff's desire to improve the clarity of the design standards.

Many neighborhood groups had complained that high residential traffic volumes and speeds had contributed to a decline in quality-of-life. In response, the City initiated an aggressive program of traffic calming to reduce travel speeds on existing streets with identified problems. However, the City recognized that this program required substantial resources and could only address the existing street system.

The development of new street standards arose from a desire to improve the design of streets at the outset so that corrective measures will not be needed later. Additionally, it was felt by many that the best streets in Sacramento included elements such as detached sidewalks and landscaped medians that were no longer allowed in the standards.

In developing the new standards, City staff adopted certain guidelines regarding right-of-way width, width of parking spaces, sidewalk design, Fire Code requirements and tree planter specifications. Some trade-offs were necessary; for example, may residents and developers wanted narrower streets while the fire department wanted wider streets. Residents wanted vertical curbs while developers wanted rolled curbs. Others advocated for wider landscaped strips and bicycle lanes, while developers desired to limit the width of the overall right-of-way.

Following the development of draft standards and a public participation process, the City of Sacramento developed new standards that included:

- The minimum width of local residential streets was reduced from 36 feet to 30 feet
- Flexibility in the design of new streets was introduced by providing options. For example, sidewalk and planter strips were designated as minimums and can be increased at the request of the developer
- For collector streets, landscaped medians are required if the projected traffic volume exceeds a certain threshold
- 7" parking lanes may be included depending on the adjacent land use
- Bicycle lanes are required on arterial streets
- Planter strips are required on all streets.
- Traffic calming devices such as bulbouts or traffic circles are encouraged to enhance the pedestrian environment

Sacramento has made some recent notable achievements with regard to street standards. At a residential street design level, Sacramento's *Pedestrian Friendly Street Standards* are revised street design standards that consider pedestrian accommodation on par with the automobile. The goals and objectives are clearly articulated with the guiding policies being to diversify

community transportation choices and enhance neighborhood livability. The *Pedestrian Friendly Street Standards* were incorporated into the *Design and Procedures Manual* in 2003.

B. Eugene, Oregon

The City of Eugene adopted a Local Street Plan in 1996 that responded to desires for narrower streets, shorter blocks, greater street connectivity and a desire for the reintroduction of elements such as planter strips, detached sidewalks and alleys, commonly found in older neighborhoods, into new subdivisions.

The new street standards included a reduction in the maximum block length for a residential street from 1,200 feet to 600 feet. The new standard was based on the existing grid pattern found in Eugene's older neighborhoods, which contained blocks measuring 400 feet by 600 feet.

Other key elements of the new standards for local streets included:

- A range of local street classifications, based on expected traffic volume, which included minimum widths varying from 21 feet for an "access lane", carrying less than 250 average daily traffic (ADT), to 34 feet for a medium-volume residential street carrying up to 750 ADT. Residential alleys were permitted with a width of 12 feet for one-way traffic or 16 feet for two-way traffic

- Local commercial and industrial streets would have a width of 30 to 44 feet

- Street connectivity was required and cul-de-sacs were discouraged unless necessitated by topographic or other physical barriers; if cul-de-sacs were necessary, then bicycle and pedestrian connections were required, wherever possible, to connect the ends of cul-de-sacs

The key lesson to be learned from these two examples is that local jurisdictions can correct street standards that have drifted too far towards wide expanses of pavement, and successfully re-introduce elements that enhance the appeal of neighborhoods.

SUGGESTED STREET STANDARDS

The first set of recommendations is for basic street standards. These standards include provisions for narrow street widths where low speeds are appropriate, detached sidewalks, bicycle facilities, and shorter block lengths.

VII. Local Streets

Key provisions of the street standards are:

- The maximum width of local residential streets is 30-32 feet (two 7-foot parking lanes and two 8-9 foot travel lanes) depending on the expected traffic volume.
- Landscape strips, separating the curb from the sidewalk, are required on local residential streets
- Maximum block length is 600 feet for low-volume residential streets and 800 feet for medium-volume residential streets
- 6" Vertical curbs are required

VIII. Collector Streets

Key provisions of the collector street standards are:

- Landscape strips, separating the curb from the sidewalk, would be required on most new streets
- Maximum block length is 1,000 feet for collector streets
- On streets with on-street parking bulbouts are encouraged at intersections to reduce the crossing distance for pedestrians and discourage speeding through intersections
- Roundabouts should be considered where residential streets intersect and the ultimate combined volume will exceed 1,000 vehicles daily or where the unimpeded distance on any of the approaches not subject to stop control exceeds 600 feet.
- Bicycle lanes should be provided on all collector streets

IX. Arterial Streets

Key provisions of the arterial street standards are:

- Bulbouts would be allowed at some intersections to reduce the crossing distance for pedestrians and discourage speeding through intersections
- Maximum block length is 1,320 feet (four intersections per mile). This could be lengthened if bike/ped paths were provided that shorten the effective block length for non-auto users
- Raised medians with turn pockets should be provided
- Bicycle lanes should be provided on all arterial streets

Figure 5: Street Standards

Item	Low Volume Residential	Medium Volume Residential	Non-Residential	Front-loading Residential	Rear-loading Residential (no driveways)	Non-Residential	Minor Arterial	Major Arterial
Daily Volume (ADT)	0 - 750	750 - 1,500	up to 5,000	1,500 - 5,000	1,500 - 5,000	13,000 or less	20,000 or less	30,000 or less
Street Characteristics								
No. of Travel Lanes	2	2	2	2	2	2	4	6
Width (curb-to-curb) (feet)	30	32	34 to 36	41 to 43	27 to 30	55 to 58	64 to 71	87 to 96
On-Street Parking (Y,N)	Y	Y	Y	Y	N	Y	N	N
Parking Lane Width (feet)	7	7	7	7	N/A	8	N/A	N/A
Travel Lane Width (feet)	8	9	10 to 11	10	10	11	11 to 14	11 to 14
Left-Turn Lane Width (feet)	N/A	N/A	N/A	N/A	N/A	10	10 to 12	10 to 12
Raised Median (Y,N)	N	N	N	N	N	N	Y	Y
Maximum Block length (ft)	600	800	800	1,000	1,000	1,000	1,300	1,300
Mimimum Sidewalk Width (feet)	5 (attached) 4.5 (detached)	5 (attached) 4.5 (detached)	5 (attached) 4.5 (detached)	6 to 8	6 to 8	6 to 8	6 to 8	6 to 8
Bicycle Lanes (Y, N)	N	N	N	Y	Y	Y	Y	Y
Transit Accomodation	None	None	Possibly bus stops	Possibly bus stops	Possibly bus stops	Bus Stops	Bus Stops	Enhanced Bus Stops
Landscape strip (Y, N)	Y	Y	Optional	Y	Y	Y	Y	Y
Minimum Landscape Strip Width (feet)	6	6	6	8	15 including sidewalk	15 including sidewalk	15 including sidewalk	15 including sidewalk

The creation of street types that could be combined with functional classifications would allow for street designs that take into account the context of the street, that is, the adjacent land uses. There are five basic designations under this hierarchy:

- Commercial Streets – These streets are typically dominated by autos maneuvering into and out of parking lot driveways in conflict with other flows. The design goal should be to keep these movements orderly by separating the flows using detached sidewalks and marked crosswalks, bicycle lanes, and medians with turn pockets
- Mixed Use Streets – These slower streets have wide sidewalks and parking lanes.
- Main Streets – The design goal of these streets is to make pedestrians comfortable so as to encourage them to make use of adjacent land uses.
- Residential Streets – The design goal is to allow people to feel comfortable in their neighborhood. This means keeping speeds low while allowing motorists to get to and from their house without undue delay
- Industrial Streets – These streets are designed for the movement of trucks and so require wider travel lanes than, say, residential roads

The following figures illustrate the key differences among the streets.

Figure 6: Low-Volume Local Residential Street

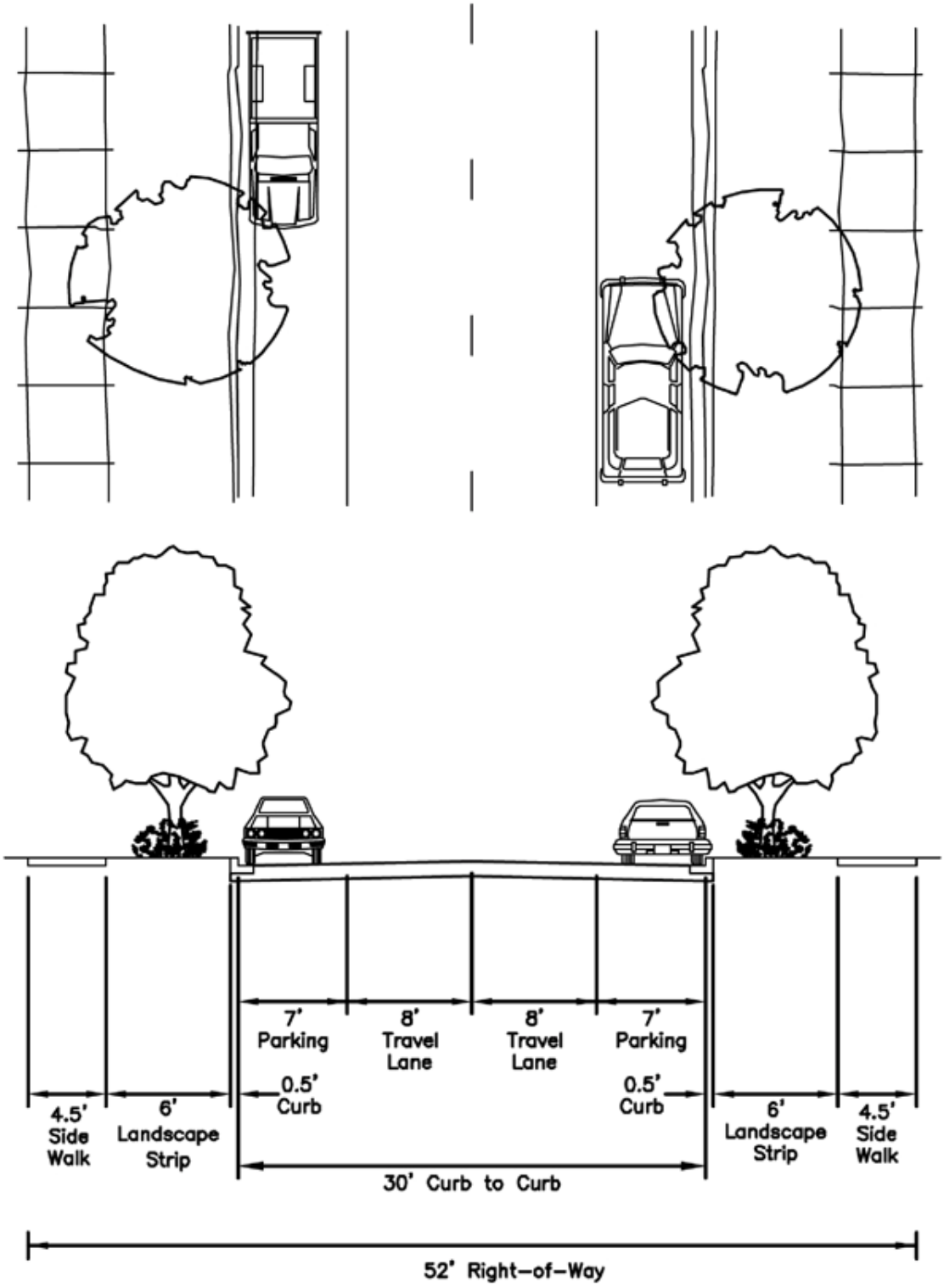


Figure 7: Local Industrial Street

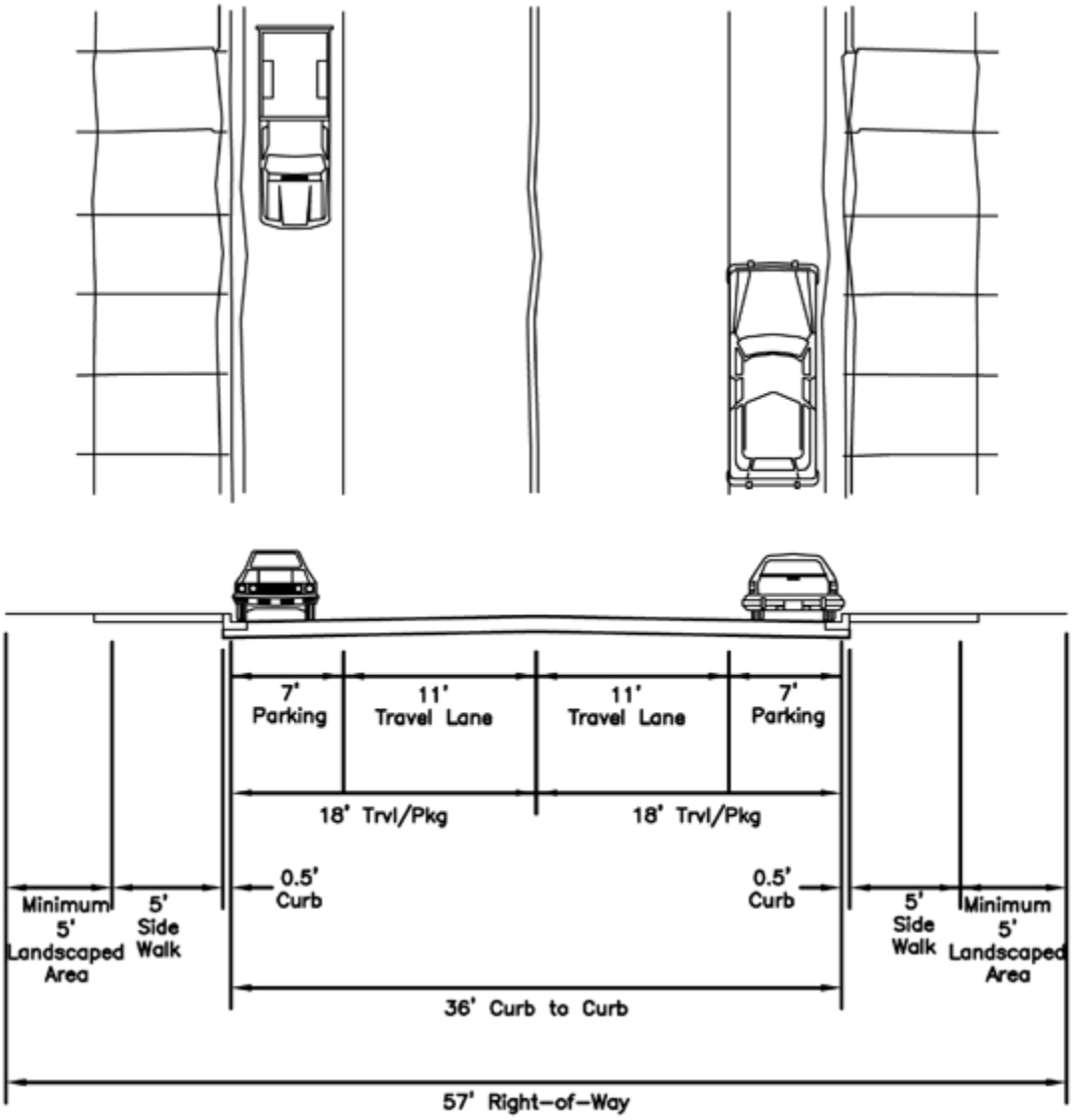


Figure 8: Front-Loading Residential Collector

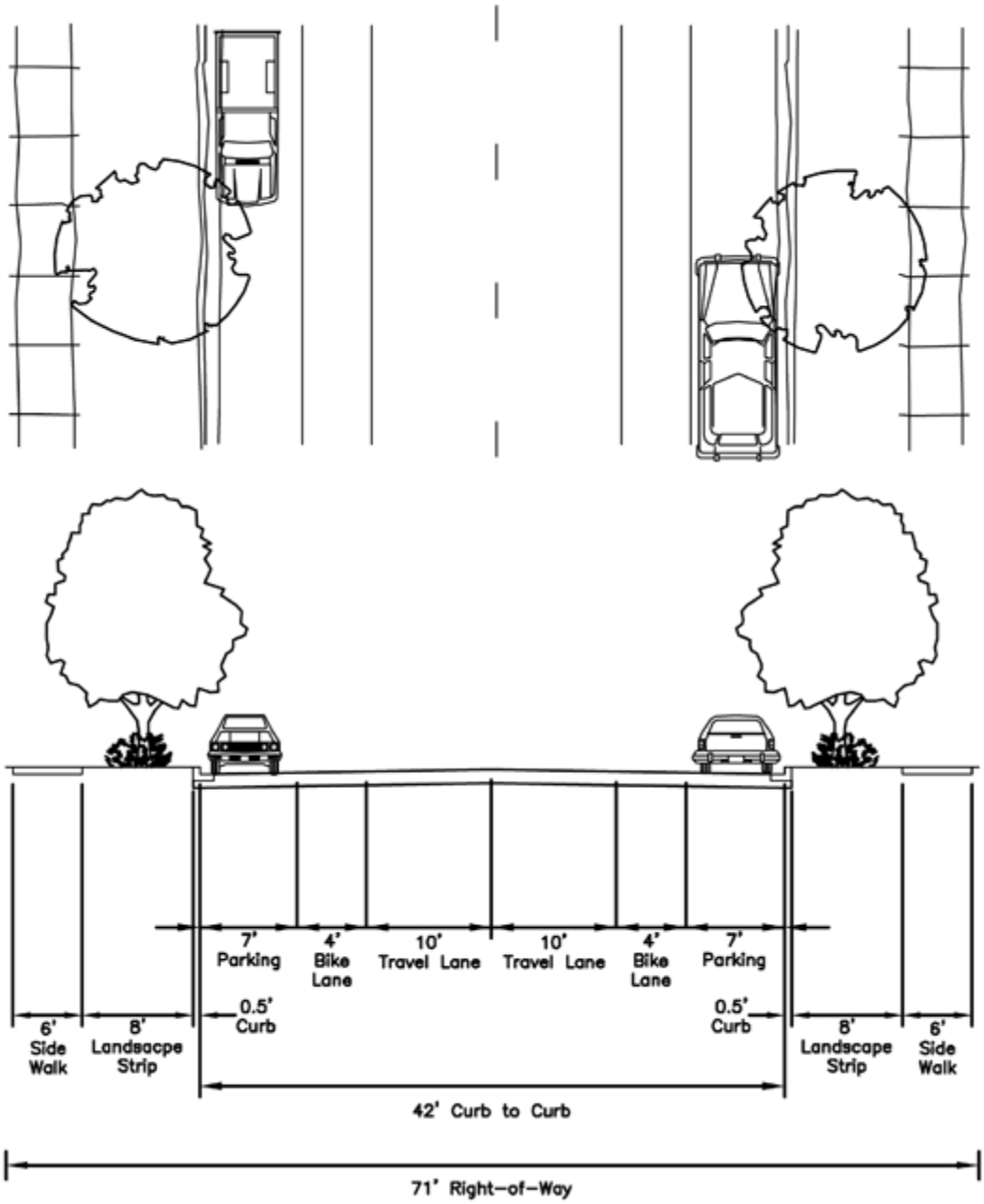


Figure 9: Main Street

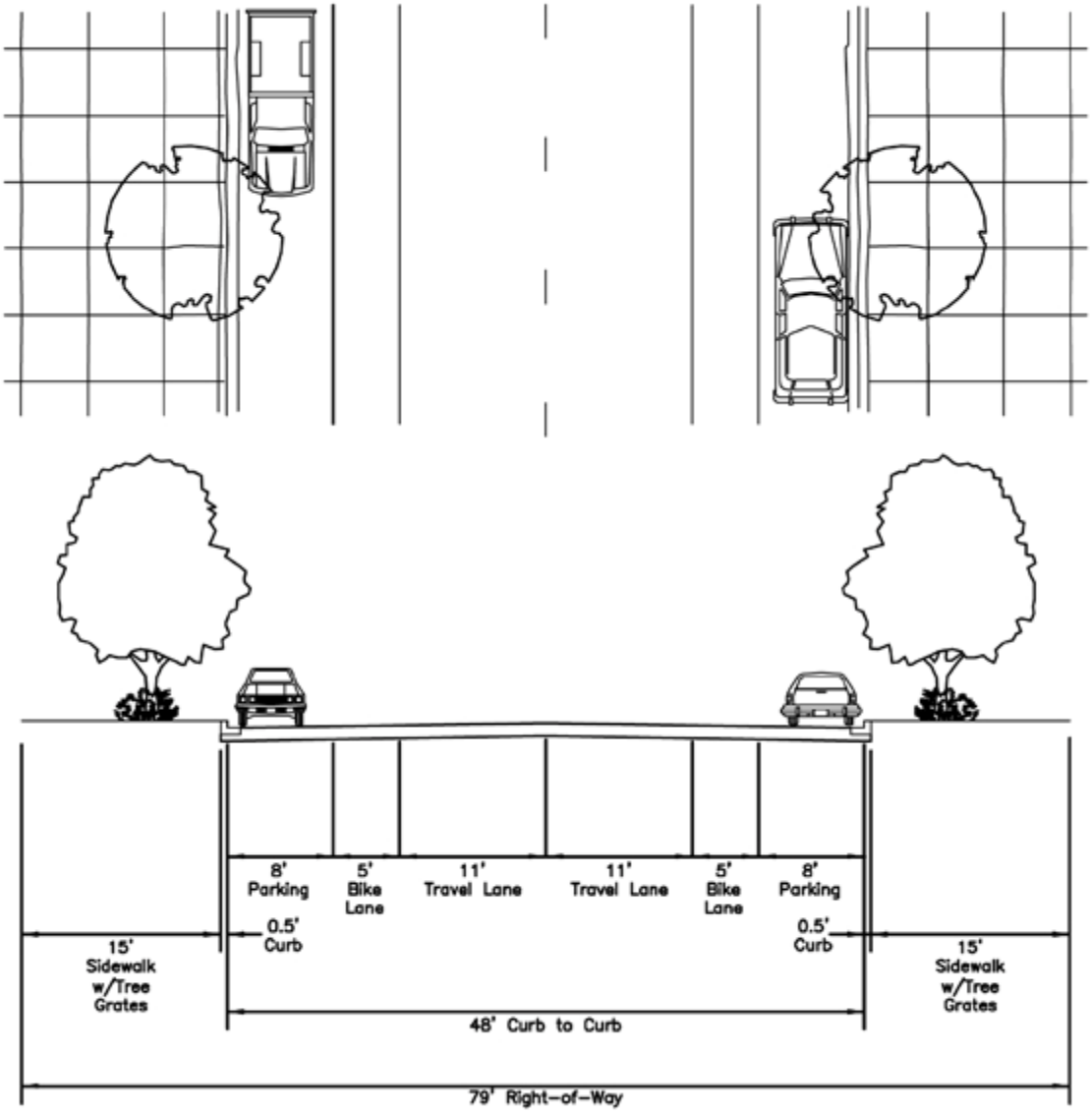
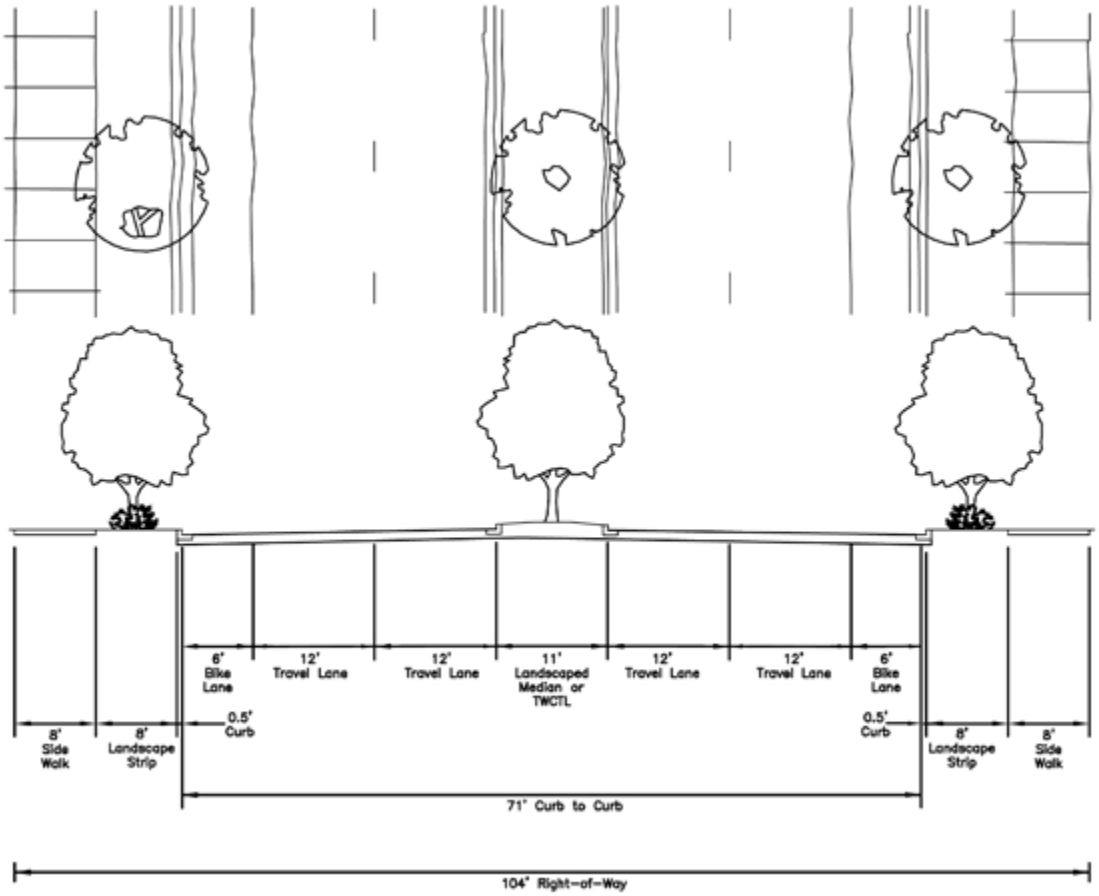


Figure 10: Minor Commercial Arterial



MAKING STREETS MATCH THEIR CONTEXT

The next refinement in the creation of street standards is to differentiate between the different types of access needs. For instance, a downtown area or neighborhood commercial district has a much greater reliance on pedestrian mobility and on-street parking than an industrial or strip commercial districts, which typically rely on automobile mobility and off-street parking. The design of the street should reflect this context.

As shown below, the traditional functional classification system (the left-hand column) can be expanded to reflect street type as well as function.

Figure 11: Combinations of Street Types and Functional Classification

Functional Class	**Street Type**				
	Residential Street	*Main Street*	*Mixed-Use Street*	*Commercial Street*	*Industrial Street*
Arterial		X	X	X	
Collector	X	X	X	X	X
Local	X	X	X		X

Note that most street types can be found in more than one functional class, and vice versa. Certain combinations such as residential/arterial seldom occur by design but occasionally occur as unintended consequences of changes to the street and/or the neighborhood. Incompatible combinations often lead to operational problems.

Incompatibility between road type and land use: *This driver is attempting to back out of his driveway into an arterial road. After several unsuccessful attempts, he eventually got a family member to stand in the road to create a gap in the traffic.*

The cells in the table indicate different characteristics that should be considered in design. For example, a street that has a main street type and an arterial function will have different characteristics and design features than a main street with a collector or local access function. Arterial streets serve longer distance trips than residential collector or local streets. As such, maintaining the through capacity should be a higher priority on a mixed-use arterial than on a mixed-use collector or local street. Similarly, a residential collector street and an industrial collector street have different characteristics. A mixed-use collector emphasizes accommodating several transportation modes while an industrial collector emphasizes accommodating heavy trucks and automobiles over other

forms of transportation. The images below show how pedestrian accommodation along a residential street, a mixed use street, and a main street can differ.

Residential Area

Mixed-Use Area

Main Street

Developing street types that could be combined with existing functional classifications allows for the adoption of multiple design and access standards within each functional classification to account for these differing needs. This allows for the introduction of street elements and operational changes in order to provide a more balanced street function for pedestrians, bicyclists, transit users, and motorists, especially in relation to adjacent land uses.

PLANNING FOR TRANSIT

Most plans for the future of the Sacramento county-wide area call for communities to be more transit-oriented than is currently the case. The key design issue in planning for transit is the out-of-vehicle time (time spent waiting and time spent walking to and from the transit stop) which often plays a more important role in the decision to use transit than time spent in the vehicle itself. Lack of attention to pedestrian facilities and amenities in the recent past has been one of the leading contributors to the declining share of transit usage. Or, to put it another way, better street design can play a major role in revitalizing transit. A transit system that features a short, comfortable walk followed by a short, comfortable wait, and then concludes with a comfortable ride will be used much more than one lacking these features.

Connectivity to the Neighborhood

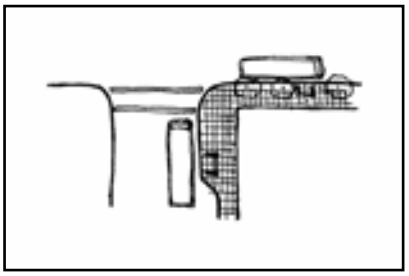
Transit stops and bike/ped paths should be planned together so as to minimize walking distances. While this may seem obvious, there are many examples of transit stops in the region that are located where sound walls or other obstacles block access from the neighborhoods the stop is intended to serve.

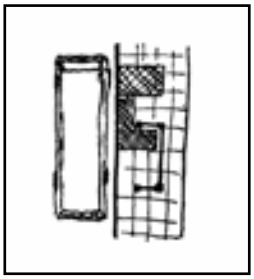
Locating the east-west and north-south bus stops on the same corner encourages a more seamless transfer from one bus line to another. Bus stops also should maintain a clear area for disabled access from the bus shelter to a waiting transit vehicle.

Access from Neighborhood: *This bus stop lacks convenient access to neighboring areas and has no safe place for passengers to wait for the bus.*

Bus Stop Bulbouts and Exclusive Bus Lanes

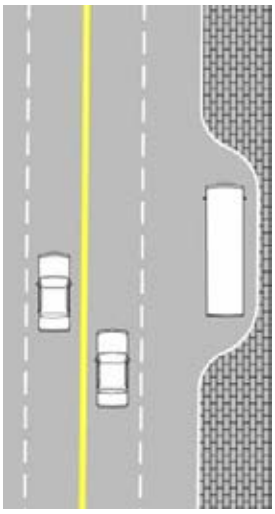
Bus bulbouts are more pedestrian friendly than bus turnouts. Besides allowing for better visibility of transit riders waiting at stops, they can be an effective traffic calming strategy for traffic adjacent to the curb. Bus turnouts should be used only where there is ample opportunity for buses to re-enter the traffic stream, such as on the far side of a traffic signal. Along corridors with high bus frequencies, exclusive bus-only lanes improve transit travel times and reliability.

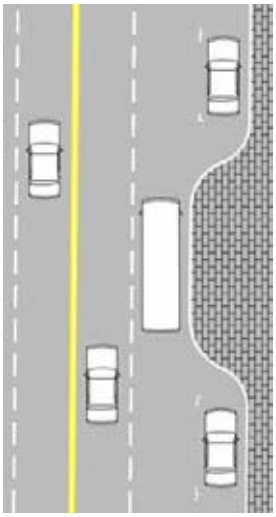




Source: Architectural Transportation and Barriers Compliance Board

Bus Turn-out.





Bus Bulb-out.

Mid-Block Bus Bulb-Out: *Mid-block bus stops often feature a bus turn-out like the one shown in the left figure. This narrows the sidewalk in the worst possible spot; where people waiting for a bus may impede pedestrians. It may also be difficult for the bus to re-enter the traffic stream. In contrast, a mid-block bulb out removes waiting passengers from the path of pedestrians, provides a space for amenities such as benches, and makes it much easier for buses to resume their journey. The choice between the two treatments should be based on context; whether at the particular site through traffic should be favored (leading to a bus turn-out) or whether the emphasis should be on pedestrian and transit service (leading to a mid-block bulb out).*

Pedestrian Crossings

Unimproved (unmarked or otherwise uncontrolled) pedestrian crossings near major transit stops can limit access to transit as well as present a safety hazard. Providing enhanced pedestrian crossing treatments near light rail stations and major bus stops can improve transit ridership through ease of access.

Enhancements near transit can include:

- Shorter and fewer traffic signal phases to reduce pedestrian wait times at intersections
- High-visibility crosswalks
- Pedestrian crossing improvements such as countdown signals and audible signals.
- “Train Approaching” warning signs for LRT stations
- Priority for transit vehicles to encourage efficient transit operation

RE-DEVELOPMENT IN CONSTRAINED RIGHTS-OF-WAY

The Blueprint Preferred Scenario envisions significant densification of land development in selected infill areas such as transit corridors and under-used commercial sites. This will increase the transportation demand locally (though may decrease the demand on a regional basis). In addition, the Blueprint calls for greater accommodation of non-auto modes throughout the region. Add to this the understandable reluctance on the part of agencies to accommodate these needs by widening public rights-of-way in existing neighborhoods, and it is clear that the right-of-way will need to be used **differently**.

The tool that most cities use to guide the re-design of streets is automobile level of service (LOS). LOS is a scale that quantifies the average delay experienced by drivers at an intersection or through a corridor. Because LOS is measured on a scale from A to F, many people mistakenly believe that it is analogous to the grading system used in schools; i.e. that LOS "A" is good and LOS "D" is bad. In fact, better analogies would be temperature or weight or price, where values convey no inherent message regarding desirability; a value of one hundred (100°, 100 lbs, $100) might be either good or bad, depending on the situation. Similarly, an LOS of "B" might be desirable in some contexts (a country road) but not in others (on a main street in front of a large pre-school).

This issue is important because some jurisdictions have LOS policies that hamper Blueprint-style redevelopment. Particularly unhelpful are policies that lock in a high minimum auto LOS, often "C", while not offering similar protection to bicyclists, pedestrians, and the neighborhood the road passes through. Such policies hamper densification by:

- In some cases approval for infill projects may be denied because nearby intersections either do not meet LOS "C" prior to the project or would not meet it if the project were built. The fact that the project would reduce the overall county-wide demand for roadspace might not be taken into account
- An infill project might be allowed, but only if nearby intersections are widened. This would raise the cost of the project in order to help the auto mode in a place where transit usage is being promoted. Moreover, road widening projects in infill areas typically reduce the space available for pedestrian amenities that are more needed after the project than before.

A better practice would be to have a flexible policy that takes into account auto LOS but only as one of a number of context-related factors that need to be considered. This would ensure that the trade-offs inherent in street re-design are open to examination and discussion. For instance, in order to provide wider sidewalks through a key transit corridor, planners and engineers may need to compromise another street element, such as parking or travel lanes.

One way to guide these decisions is to prioritize roadway users. When establishing bicycle, pedestrian, and transit networks, cities have an opportunity to re-visit the function of the street. Along certain streets, a city may wish to prioritize pedestrian or bicycle level-of-service over auto level-of-service. There are established ways to measure bicycle and pedestrian level-of-service, included in the *Best Practices for Bicycle and Pedestrian Planning* (a companion piece to this document).

Current best practice is to apply level of service D as the acceptable auto level of service for all facilities, with consideration of LOS E or F for freeways, main streets, and pedestrian zones. In addition to considering modifying vehicular level of service objectives, policy direction to assess convenience and comfort of transit, pedestrian and bicycle travel may be key considerations. Level of service objectives could also include a context sensitivity component such that priority modes are identified for various street types. For example, for an industrial arterial vehicle level of service would likely be defined as the highest priority function, while for a main street (i.e., neighborhood shopping district) pedestrian level of service may be the highest priority function.

LOCAL EXAMPLES

The photos below show examples of good and bad streets in the Sacramento area. These photos are not intended to draw attention to specific sites but rather to point out to the reader things to look for in the field.

Bad: *This street lacks pedestrian facilities and has vehicles crossing the frontage road mid-block from both sides. It is in a residential area.*

Good: *This street features planter strips, detached sidewalks, a planted median, and a roundabout that slows vehicles without stopping them.*

Bad: *This wide (36ft) straight street encourages speeding. Rolled curbs, narrow sidewalks, and lack of planter strips make pedestrians nervous when cars pass.*

Besides the extra-wide street itself, there are underground utilities in an 8ft band on the outside of the sidewalk. Shade trees must be planted outside this band, effectively eliminating any possibility of a canopy over this street.

Better: *This street serves a similar neighborhood to the previous photo, but has planter strips and detached sidewalks. The improvement is immediate and will literally grow over time as the tree mature and begin to provide shade.*

Note the human-scale lamp post compared to the highway-style street light in the previous photo. This is another visual cue that high speeds are not appropriate in this area.

Best: *This street features shaded sidewalks, planter strips, vertical curbs, short blocks and narrow lanes. This is close to the ideal for a residential street.*

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